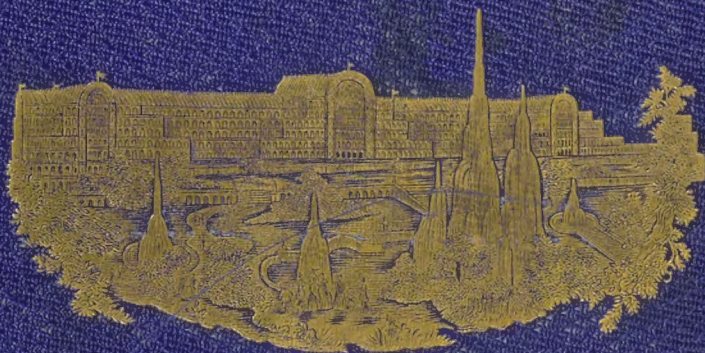


SYDENHAM

CRYSTAL PALACE



EXPOSITOR.

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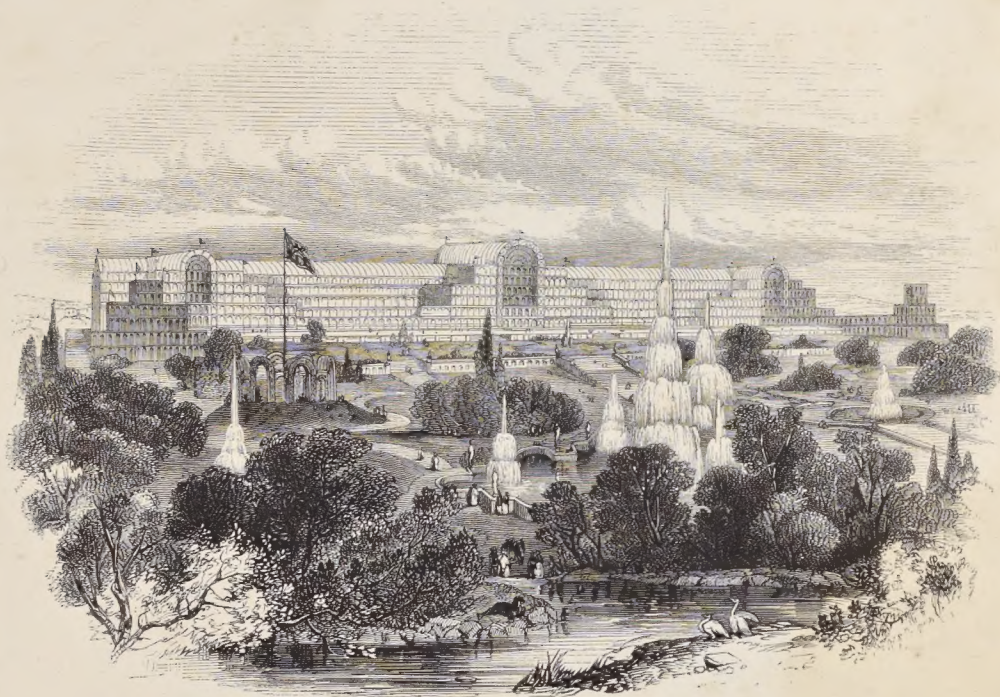
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THE SYDENHAM
CRYSTAL PALACE
EXPOSITOR.



WITH

ILLUSTRATIONS ON STEEL AND WOOD.

LONDON:

JAMES S. VIRTUE, CITY ROAD, AND IVY LANE.

SOLD BY ALL BOOKSELLERS.

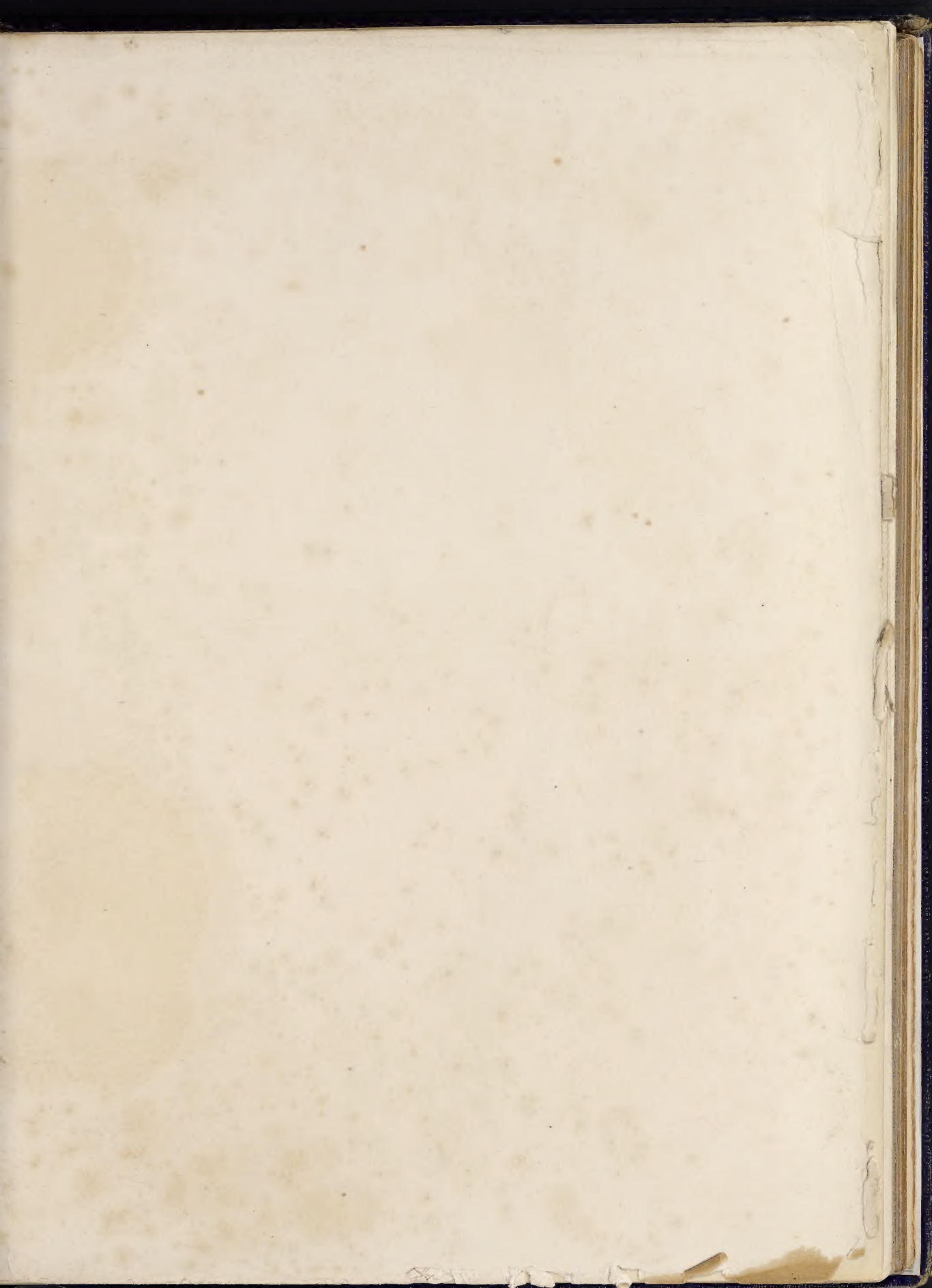
SYDENHAM
CRYSTAL PALACE EXPOSITOR.



W.C. MARSHALL, A.R.A.

R.A. ARTLETT.

With Engravings on Steel and Wood.





HER MAJESTY THE QUEEN.

ENGRAVED BY R. A. ARTLETT. FROM THE BUST BY JOSEPH DURHAM.

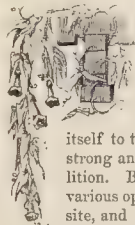
LONDON, PUBLISHED FOR THE PROPRIETORS.

THE CRYSTAL PALACE EXPOSITOR.



OPENING OF THE CRYSTAL PALACE BY HER MAJESTY.—MR. LAING DELIVERING THE ADDRESS.

INTRODUCTION.



THE international exhibition of the products of ART AND INDUSTRY, which was held in the Crystal Palace, Hyde Park, in 1851, produced a permanent impression on the public mind. It had afforded gratification and instruction to millions; and although government had pledged itself to take down the building at a specified date, a very strong and general feeling was expressed against its demolition. Before the magnificent structure had been raised, various opinions had been entertained as to the most eligible site, and the selection of Hyde Park had been vigorously resisted by the owners of property in its neighbourhood.

Under these circumstances, after the choice of locality had been finally settled, it was distinctly understood that the edifice should be removed when its temporary purpose had been served. Such a pledge having been given, its retention would have been a flagrant breach of faith. Nevertheless, many efforts were made to preserve the fabric; and some proposed to convert it into a winter garden. A variety of schemes were propounded, all tending to convert it into a national structure. The last struggle was made by Mr. Heywood, in the House of Commons, on the 29th April, 1852, when the government declined the responsibility of purchasing and upholding the building; and, on a division, Mr. Heywood's motion was lost by a very decided majority.

The aid of Parliament being thus rendered hopeless, private enterprise alone—which has effected so many wonders in this country—could rescue the edifice from destruction. The site, indeed, was lost for ever; but the materials might be removed to another locality. This idea presented itself to Mr. Leech, of the firm of Johnston, Farquhar, and Leech, solicitors; and he resolved to organise a company and raise the funds necessary to complete his project. In this he completely succeeded; and, on the 24th of May, 1852, the Crystal Palace, as it stood, was purchased from Messrs. Fox and Henderson, by whom it had been built. As associated with this magnificent scheme, the names of the original purchasers deserve to be here recorded. They were Mr. T. N. Farquhar, Mr. Francis Fuller, Mr. Robert Gill, Mr. Harman Grise-wood, Mr. Joseph Leech, Mr. J. C. Morice, Mr. Scott Russell, Mr. Leo Schuster, and Mr. Samuel Laing. The price paid by these gentlemen to Messrs. Fox and Henderson for the Palace was £75,000; and those eminent contractors agreed to take it down, and remove it, and construct a new edifice for £120,000. These arrangements being matured, the Crystal Palace Company was formed, with an original capital of £500,000, divided into 100,000 shares of £5 each.

The next proceeding was the choice of a locality. Space might have been obtained in London, or in its immediate suburbs for a mere building, but the directors of the undertaking had more enlarged and wiser views. They determined to surround the new Palace with a spacious garden, ornamented with terraces, fountains,

statues, and sheets of water; and devote a portion of it to the figures of the extinct animals which geology has discovered. To effect these objects, a considerable area of ground was requisite; and to give the best effect to the whole construction, it was desirable that the Palace should be built on a commanding eminence, surrounded by rural scenery. In the choice of a site, a rapid and inexpensive access from London was indispensable. After mature deliberation, Penge Park, Sydenham, was selected, as uniting in itself all the advantages and facilities for carrying into execution this vast and noble design. The property belonged to Mr. Schuster. It contained 171 acres; and the purchase, arranged by arbitration, was fixed at £86,661. In addition, 178 acres were bought for £81,000; a portion of which was afterwards resold by the Company at a profit of £50,000. On the 28th of January, 1853, a charter was granted to the Company by the Earl of Derby's administration—thus conferring on the enterprise the character of a National Institution.

While the building was erecting, Mr. Owen Jones and Mr. Digby Wyatt, to whom the superintendence of the FINE ART DEPARTMENT had been entrusted, were sent on a mission to the continent, to obtain models of the principal works of Art in Europe. The Earl of Malmesbury, at that time Secretary of State for Foreign Affairs, gave those gentlemen recommendatory letters to the English ambassadors resident at the various Courts to which they were accredited, expressive of the interest felt by our government in the success of their labours. With the exception of Rome, Padua, and Vienna, every aid was afforded to the travellers; but at the three cities mentioned they met with a narrow-minded refusal. In one district in England this discourtesy was imitated—the churchwardens of Beverley Minster, in Yorkshire, not permitting a copy to be taken of the Percy Shrine. The jealousy or envy of foreigners may admit of some excuse, however small; but that any body of Englishmen should be tainted by so illiberal a spirit as that manifested by the churchwardens of Beverley Minster would be incredible, were not the fact too disgracefully notorious.

Sir Joseph Paxton, the most celebrated horticulturist of the day, was appointed to superintend the gardens and collect plants to be placed in the interior of the Palace. He obtained the beautiful stock of palms which belonged to the Messrs. Loddiges of Hackney, and some splendid orange-trees from the conservatory of Versailles. The various courts contained in the building were formed and decorated under the eye of taste and judgment; gentlemen being appointed most eminent for their knowledge in each department, and for their skill in the art of reconstruction. Workmen from almost every continental nation were employed, and laboured together with remarkable unanimity. As many as 6400 men were engaged during the progress of this gigantic undertaking.

The Crystal Palace is built upon a basement story, which is to be appropriated to machinery in motion. By this arrangement a considerable elevation is gained, as in Somerset House compared with the New Houses of Parliament on the river frontage, and imparts to the whole structure a most commanding appearance. Above this basement floor the building consists of a grand central nave, two side aisles, two main galleries, three transepts, and two wings. With the exception of a portion at the north front, panelled with wood, the whole is built of iron and glass. As the dimensions given in Mr. Phillips's *Guide Book* are official, they are transferred to these columns, and to ensure perfect accuracy are given in his own words: "The whole length of the main building is 1608 feet, and the wings 574 feet each, making a length of 2756 feet, which, with the 720 feet in the colonnade leading from the railway-station to the wings, gives a total length of 3476 feet; or nearly three quarters of a mile of ground covered with a transparent roof of glass. The length of the Hyde Park building was 1848 feet, so that, including the wings and colonnade, the present structure is larger than its predecessor by 1628 feet; the area of the groundfloor, including the wings, amounts to the astonishing quantity of 598,396 superficial feet; and the area of gallery flooring of building and wings to 245,260 superficial feet, altogether 843,656 superficial feet. In cubic contents the Palace of Sydenham exceeds its predecessor by nearly one half. The width of the nave, or main avenue, is 72 feet, which is also the width of the north and south transepts; and the height of all three from the floor to the springing or base of the arch is 68 feet; the height from the flooring to the crown or top of the arch being 104 feet—just the height of the transept at the old building. The length of the north and south

transepts is 336 feet respectively. The length of the central transept is 384 feet; its width 120; its height from the floor to the top of the louvre, or ventilator, 168 feet; from the floor to the springing of the arch 108 feet; and from the garden front to the top of the louvre 208 feet—or six feet higher than the Monument. The glass employed in the roof is 1-13th of an inch in thickness (21 oz. per foot). The total weight of iron used in the main building and wings amounts to 9041 tons, 17 cwt., 1 quarter. The superficial quantity of glass used is 25 acres; and if the panes were laid side by side, they would extend to a distance of 48 miles; if end to end, to the almost incredible length of 242 miles."

The first column of the Sydenham Palace was raised on the 5th August, 1852; and the building was opened to the public, in a yet unfinished state, on the 10th June, 1854, under the cheering auspices of Royalty. This happy event it is our duty to commemorate in this introductory chapter. The day was most favourable, the sun bright and warm, and an hour before the opening all the approaches were crowded by anxious and excited visitors. Under a canopy suspended from the roof of the central transept stood the chair of state, prepared for her Majesty, and ere she arrived the whole length of the nave and the first gallery were densely crowded, except the dais reserved for the queen and her royal guests. Behind the dais rose an amphitheatre appropriated to three bands, several eminent vocalists, and a volunteer chorus of 1800 singers. Miss Clara Novello was the solo singer at this inaugural ceremony. The Lords and Commons occupied amphitheatres in the galleries. Several Indian princes, arrayed in the full splendour of oriental costume, were present. A host of mayors and aldermen, headed by the Lord Mayors of London, Dublin, and York, were ranged on the floor of the transept, in the imposing dignity of official robes and civic fur. As the clock struck three, the arrival of Her Majesty was announced amidst repeated peals of loyal cheering, which rang joyously and exultingly through the crystal arches. Her Majesty took her seat on the raised dais, accompanied by the young King of Portugal and his brother the Duke of Oporto, the Duchess of Kent, and the Princess Royal, and the Princess Alice on her right hand, while his Royal Highness Prince Albert, the Prince of Wales, Prince Alfred, the Duchess of Cambridge, and the Princess Mary of Cambridge were on her left. Behind this august circle stood the Duchess of Sutherland, the Duke of Wellington, the Earl of Breadalbane, the Marquis of Abercorn, the Ladies in Waiting, Equerries, and other official personages. As soon as the illustrious party had taken their seats, the army of singers, accompanied by the three bands, executed the national anthem, "God Save the Queen," in a style of excellence that drew delicious tears from many an eye. This performance fully proved that the building was admirably constructed for musical purposes, as the sweet and swelling strains were distinctly heard in all directions.

When the music ceased, Mr. Laing, chairman of the Company, ascended the dais, and read the following address from a parchment roll:—

"May it please your Majesty to accept the assurance of our devoted loyalty and attachment to your throne and person, and of our gratitude for the kind condescension with which your Majesty has consented to honour with your presence the ceremony of this day.

"Among the many memorable events of your Majesty's happy reign, the Great Exhibition of 1851 occupied a prominent place. The idea, for which the nineteenth century was indebted to your illustrious Consort Prince Albert, of an exhibition open to the products of all industries and of all nations, marked of itself an era in the annals of civilisation. It marked the disappearance of old commercial jealousies and international prejudices before the combining influences of modern science and the liberal spirit of modern legislation.

"The realisation of this idea was worthy of its conception. An entirely novel order of architecture, producing, by means of unrivalled mechanical ingenuity, the most marvellous and beautiful effects, sprang into existence to provide a building. In this building a collection of the choicest products of all that the human intellect contrives and the human hand executes, was exhibited during a period of six months, for the instruction and delight of assembled millions.

"The conduct of those millions was of itself one of the most remarkable features of this great event. The perfect order and decorum which prevailed, the enlightened interest and ready

appreciation which were displayed, afforded the most conclusive refutation of the prejudice which regarded the industrious masses of our English nation with mistrust, and represented them as rude, destitute of refinement, insensible to the humanising influences of Art, and incapable of rational and enlightened refinement.

"The Great Exhibition of 1851 afforded a conclusive proof, by the enlightened interest and ready appreciation which were displayed, that the people of England were prepared to receive instruction when it was afforded to them, and to embrace whatever opportunities were given for the cultivation of taste and for the development of the instinctive love of the beautiful.

"The establishment of this fact, and the recognition of the civilising influences so widely exerted by the Great Exhibition, led to a general feeling, when its removal from Hyde Park became necessary, that some attempt should be made to perpetuate those influences in a more permanent form in another locality.

"This undertaking, the inauguration of which your Majesty this day honours with your presence, originated in this feeling. Private enterprise, appealed to in the interests of civilisation, supplied the funds. The men whose names had acquired European celebrity in connection with the Crystal Palace of 1851, placed their services at the disposal of the directors in their respective departments. The enlightened patronage of Royalty, and the sympathy and the support of public opinion, the generous co-operation of distinguished men in science and art, urged on the undertaking and impressed it with a national character. The liberality of foreign governments threw open every museum, and afforded facilities never before known for acquiring a complete series of the finest works of ancient and modern art.

"Thus aided and encouraged, the original idea expanded into wider dimensions. It was resolved to attempt the creation of a Palace and Park which should at once be a fitting ornament of the greatest metropolis of the civilised world, an unrivalled school of art and instrument of instruction, and a monument worthy of the age and of the British empire.

"It was hoped to prove that the spirit of a free people can not only create wealth, extend commerce and colonies, and take the lead in every department of moral and material progress, but can at the same time rival the proudest works of absolute monarchs, lavishing the resources of nations in the decoration of a favourite residence or the embellishment of a chosen capital.

"With these views the Directors embraced three leading objects in their undertaking—amusement and recreation, instruction, and commercial utility.

"The first object was sought to be attained by the creation of a New Crystal Palace, far exceeding the original structure of 1851 in dimensions and in architectural effect, of a terraced garden and park on a scale of magnificence worthy of the palace, and of a system of fountains and waterworks exceeding anything which the world has yet witnessed.

"The educational object embraces a complete historical illustration of the arts of sculpture and architecture from the earliest works of Egypt and Assyria down to modern times, comprising casts of every celebrated statue in the world, and restorations of some of its most remarkable monuments.

"In science, geology, ethnology, zoology, and botany, receive appropriate illustrations—the principle of which has been to combine scientific accuracy with popular effect; and in its ultimate development the Directors are bold enough to look forward to the Crystal Palace of 1854 becoming an illustrated encyclopædia of this great and varied universe, where every art and every science may find a place, and where every visitor may find something to interest, and be taught through the medium of the eye to receive impressions kindling a desire for knowledge, and awakening instincts of the beautiful.

"Combined with art and science, industry receives its due interpretation. The Industrial Exhibition is based on principles of commercial utility, taught by the experience of the Great Exhibition of 1851. The advantage to national interests of a place where the best products of different industries and localities could be seen and appreciated, was no less manifest than the importance to individual producers of such an unrivalled means of publicity, and the conveniences to buyers and sellers of such a world's fair for the exhibition and inspection of goods, and the transaction of mutual business.

"The Crystal Palace of 1854 will perpetuate those advantages under regulations suited to the permanent character of the Industrial Exhibition. As in 1851, the doors will be thrown open freely for the products of all nations; and the presence of so many distinguished representatives of foreign governments on this occasion, affords a gratifying proof that enlightened men throughout the world are alive to the advantages of such common centres of friendly union, both to the arts of industry and to the highest interests of peace and civilisation.

"Such, may it please your Majesty, is a brief outline of the objects which the promoters of this undertaking have proposed to realise. It will be apparent that the comprehensiveness of the plan precludes the idea of absolute completeness. The colossal scale of the proposed system of waterworks makes another year requisite to insure their proper display. The industrial department being of a permanent character cannot, as in the case of a temporary exhibition, be finished by a given day. The plants and flowers, which will form such a main feature of attraction, require time for their growth. The educational scheme is purposely traced so as to leave room for future development.

"Under these circumstances, the Directors have considered it their duty to throw the Palace and Park open to the public as soon as they are sufficiently completed to enable a fair judgment to be formed how far the undertaking deserves success, and how far it has achieved it.

"Your Majesty has heard the statement of the motives in which this enterprise originated, and of the principles on which it has been conducted; it rests with your Majesty now to judge whether the performance equals the promise, and whether the Palace and Park, with their varied contents which surround us, are worthy to be considered—what the Directors, whose organ I am, would think their highest praise—a legitimate offspring of the Great Exhibition of 1851, and an appropriate development of one of the noblest ideas of modern civilisation."

To this address her Majesty made the following gracious reply:—

"I receive with much pleasure the loyal and dutiful address which you have presented to me upon the present occasion.

"It is a source of the highest satisfaction to myself and to the Prince my Consort to find that the great Exhibition of 1851, which was so happily inaugurated under our auspices, suggested the idea of this magnificent undertaking, which has produced so noble a monument of the genius, science, and enterprise of my subjects.

"It is my earnest wish and hope that the bright anticipations which have been formed as to its future destiny may, under the blessing of Divine Providence, be completely realised; and that this wonderful structure, and the treasures of art and knowledge which it contains may long continue to elevate and instruct, as well as to delight and amuse, the minds of all classes of my people."

Gold medals commemorative of the opening, struck by Messrs. J. R. Pinches and Co., were then presented to her Majesty by Mr. Fuller, the Managing Director; after which Mr. Laing presented the leading gentlemen, who had superintended the various departments, to the Queen, who graciously accepted the various Hand-books. A procession was then formed of the Directors, Contractors, and other functionaries. To them succeeded Mr. Fuller, Mr. Laing, and Sir Joseph Paxton; her Majesty and the royal *cortège* immediately followed, making a tour of the building and inspecting the courts. This ceremonial being concluded, her Majesty resumed her seat on the dais, and the procession clustered round her temporary throne. The Hundredth Psalm was sung with impressive solemnity, when the Archbishop of Canterbury, standing forward at the left of the throne, offered up the following prayer:—

"Almighty and everlasting God! who dost govern all things both in heaven and earth, incline thy ear, we entreat thee, to thy people which call upon thee, and graciously receive our prayers! Without thee nothing is strong, nothing is holy. 'Except the Lord build the house, their labour is but lost who build it.' And now we entreat thee to bless the work which we have accomplished in this place, and to render it the means of promoting thy glory. May those who admire the wonders of nature which are here displayed, be taught to perceive in those the vigour of that creative wisdom by which all things fulfil the purposes which they are designed to serve; enable those who survey the wonders of art and

industry which surround them, to remember that it is by thee that knowledge is increased, and science made to minister to the benefit and comfort of mankind; for the spirit of man is from thee, and the inspiration of the Almighty giveth him understanding; therefore, 'Not unto us, O Lord, not unto us, but unto thy name be all the praise.' While we contemplate the remains of former ages and the monuments of ancient greatness, enable us to profit by the examples they afford of the instability of earthly things, and ever to bear in mind that according to thy providence nations flourish or decay; that thou hast but to give the word, and the richest may become poor, and the proudest be levelled into dust. Therefore, O Lord, we entreat thee so to regulate the thoughts of our hearts that they may not be lifted up that we forget the Lord our God, as if our power or the might of our hands had gotten us this wealth. It cometh of thine hand, and is all thine own; both riches and honour come of thee, and thou reignest over all, and in thy hand it is to make

great and give strength to all. Now, therefore, O Lord, we thank thee and praise thy glorious name, and beseech thee to grant that the many blessings vouchsafed to our nation may dispose our hearts to serve thee more faithfully, and in all that we undertake to seek thy honour and glory. Above all teach us so to use the earthly blessings thou givest us richly to enjoy, that they may not withdraw our affections from those heavenly things that thou hast prepared for those that love and serve thee, through the merits and mediation of thy Son Jesus Christ our Lord, in whose prevailing words and name we further call on thee."

The Archbishop concluded the religious ceremony with the Lord's Prayer. The "Hallelujah" chorus was performed by the orchestra with overpowering effect; when the Marquis of Breadalbane, as Lord Chamberlain, declared the Palace open by her Majesty's command. The national anthem then resounded from the 1800 musicians, and the inauguration of the building was complete.



SCOTT'S ATLAS—R.N.L.

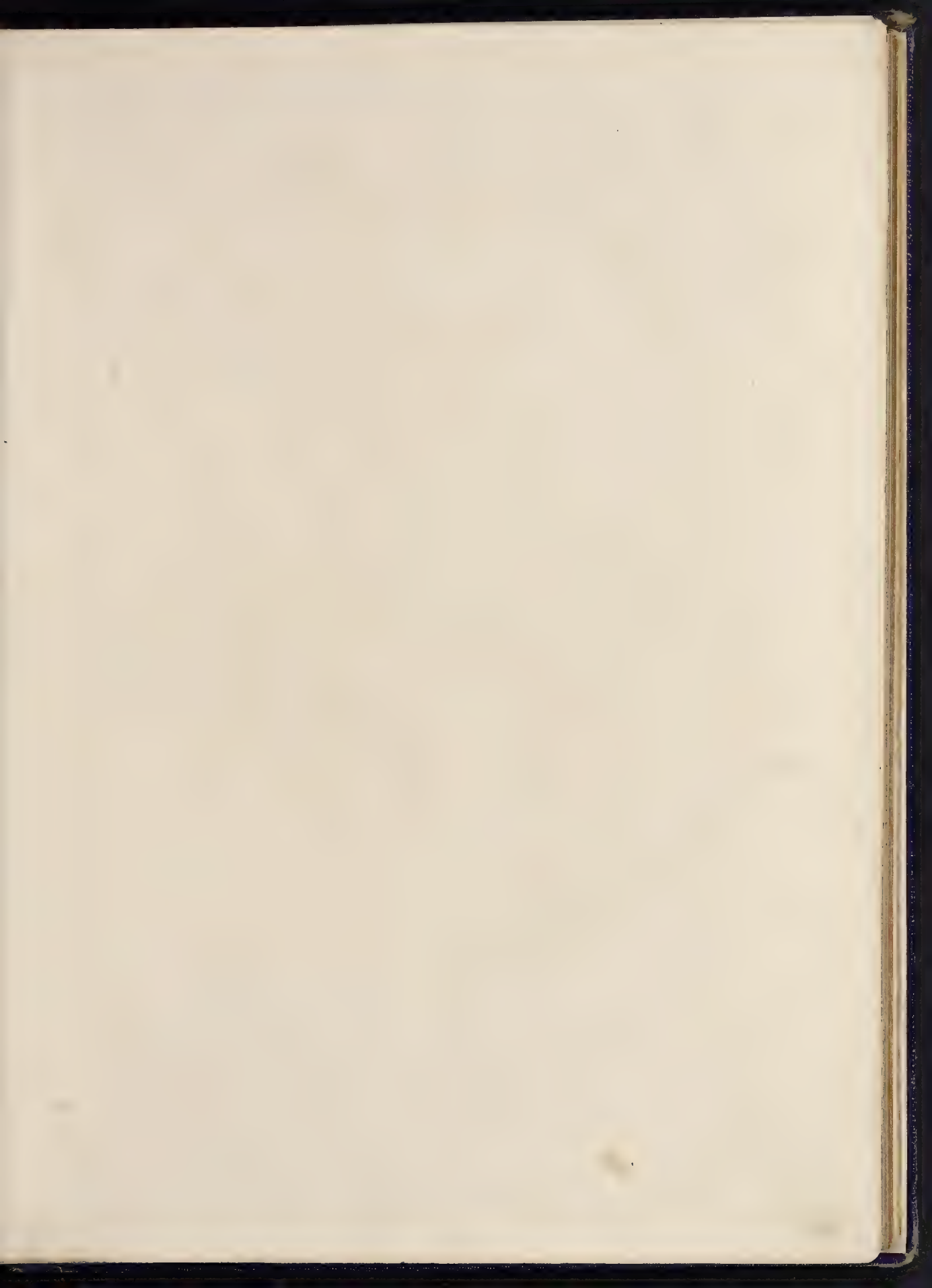
GENERAL REMARKS.

IN the Address delivered by Mr. Laing, the purposes to which the magnificent building is dedicated are comprehensively stated. They are emphatically of a national character, and every subject of these realms is personally interested in the success of the undertaking. Both within and without the walls of the Palace the student finds materials for meditation. He may trace history up to its remote sources in the restored ruins of buried empires, and penetrate the obscure recesses of the earliest traditions. The old kingdoms of Assyria, Babylonia, and Egypt, display their wondrous monuments to his astonished gaze; and his mind is even led back to the plains of Shinar, the Dispersion of Mankind, and the Confusion of Tongues. Piety is warmed, and faith strengthened, by the confirmatory evidence of the truth of Scripture discovered in the cuneiform writings stamped on the bricks and cylinders of Nineveh, Babylon, and Persopolis. Even the casual observer, who merely seeks to gratify the eye, must be devoid of all finer feelings if he is unawed by the contemplation of these solemn memorials of the past; and it is difficult to believe that any who witness them can ever shake off the impression they are so calculated to produce. On the contrary, the veil once raised they will be disposed to extend their inquiries, and enlarge their sphere of knowledge by reading and criticism; and this is one of the educational forms under which the utility of the Crystal Palace may be demonstrated; for had not these objects been palpably represented to the senses, they would have remained unknown to the millions who have neither the leisure nor the opportunity to peruse historical and

scientific works, and who want a friendly guide to conduct them to the portals of the temple of knowledge. That guide they will find in the various courts contained in the interior of the building.

If the Assyrian and Egyptian courts carry us back to the most remote antiquity, illustrating their curious architecture, their gigantic sculptures, their long-forgotten alphabets, and their ingenious hieroglyphics—and if they humble our pride in teaching us that thousands of years ago nations existed who executed colossal works which modern science and mechanism might fail to accomplish, the Greek and Roman sculpture courts teach us how much we have yet to learn in the highest departments of Art, by exhibiting to us models of grace and symmetry, beautiful in their conception, and unapproached in the delicacy and completeness of their execution. These courts constitute a real school of Art, not only for those who may handle the chisel professionally, but for all classes. There can be no doubt that the itinerant vendors of images have done much, humble though their calling be, to improve the artistic taste of the people; how much more then may be reasonably expected from these groups of classified figures, selected with the finest judgment, and arranged with consummate skill? That the national taste has been highly purified during the last thirty years is proved by the vast demand for illustrated books, and the high favour now accorded to Parian statuettes. This culture extends much further than might be supposed on a superficial reflection: it enters into domestic life, into the humblest household; and, however unperceived in its silent operation, promotes neatness, cleanliness, and self-respect,—for it is one of the blessings of Art to be diffusive, and variously to influence wherever it penetrates. It acts somewhat like the love of flowers; and who has not observed that the interiors of those cottages are the most tidy to which a

* These figures are at the north end of the Palace; we shall refer to them when we treat of Ethnology.





small garden is attached? In this sense we may consider the sculptures of the Crystal Palace as educational of the better feelings of the millions.

The Alhambra Court is unique in its kind, introducing the visitor to the genius of the Moors or Morescoes, long dominant in the most beautiful portions of Spain, and by whom this magnificent structure was raised. It is remarkable for the minuteness of its elaboration and the brilliancy of its colouring, but of course only represents a portion of the original. The parts reproduced are the "Court of Lions," the "Hall of Justice," and the "Hall of the Abencerrages." Here, too, while the eye is delighted, the mind is instructed. This once mighty race, skilled to an eminent degree in architecture, learned in the exact sciences, and of chivalrous valour, has been swept away—a memorable instance of the instability of human greatness! While we contemplate this scene, and think of the conquest of Granada, in which city the Alhambra stood, it is painful to remember that the first use that Ferdinand and Isabella made of their victory was to establish the Inquisition. It avenged the expulsion of the Moors.

The design of the Pompeian Court is to make us acquainted with what is most remarkable in the discovered remains of Pompeii and Herculaneum, buried beneath the eruption of Vesuvius, in the year 79 of our era. It represents a dwelling-house divided into its separate apartments. Little did any of its inhabitants foresee that savage Britain would one day commemorate the existence of their city, and their domestic habits, within a few miles of the banks of the Thames!

The Byzantine and Romanesque Court is one of the most attractive in the building; for the structures it represents are not mere reproductions, but many of them are fac-similes of existing edifices in Italy, Germany, Belgium, France, and our own country. The first epoch of Byzantine architecture is coeval with the conversion of Constantine to Christianity, in the early part of the fourth century. When he transferred the seat of government from Rome to Byzantium (the modern Constantinople), he remodelled the old architecture, introducing the figure of the cross as the characteristic of the new system. The date is about the year 330. But modifications in course of time were introduced, producing a mixture of the Greek, Roman, and Turkish styles.

The Renaissance Court introduces us to the style which succeeded the Gothic, about the beginning of the fifteenth century; while the Italian Court conveys to us the change, sometimes called "Modernised Roman," which ruled from the beginning of the sixteenth century. The German, English, French, and Italian Mediæval Courts, explain by their titles the epoch to which they refer.

Departments are assigned to Ethnology, Zoology, and Botany, and these are so arranged as to group together, in classified order, the men, animals, and plants, found under different climates. Here may be seen figures of the Zulu Kaffirs, the Bosjesmen, the Earthmen, the Danikils of Eastern Africa, the Hindoos and Malays, the Laplanders, the Mongolians, and other varieties of the human race. Distributed around them are the animals inhabiting the countries in which they live. In the gardens are the "Geological Islands," showing the strata of the earth, with figures of the gigantic creatures which once inhabited this globe.

In this rapid glance at the treasures of Art and Science contained within the Crystal Palace, nothing more has been attempted than to trace an outline of the contents, as it is intended to illustrate each court, historically and pictorially, in full, in our future pages. It must be borne in mind that the original design of the directors of the Company is far from being completed, though it is wonderful how much has been effected in the short space of two years. One of the peculiar merits of this grand Temple of Intellect consists in its expansive capabilities, and no doubt it will keep pace with the progress of discovery and the requirements of the age. In no unfriendly spirit, we would point out what we consider a deficiency—it is the absence of an East Indian Court. With an oriental empire extending from Cape Comorin to the Himalayas hundreds of thousands of our countrymen are intimately associated, and that empire possesses a remote antiquity as well as Assyria and Egypt; nor are its monuments less interesting. Every facility exists for ornamenting such a court, and there is abundance of space devoted to very inferior objects. As an argument in favour of this proposition, the following extracts are taken from Dr. Buist's *Notes on India*—

"The elaborate stone carving of Central India, Rajpootana, and Goozerat; the embossed and enriched silver work of Cutch and Agra; the microscopic paintings of Delhi and Lahore; the carvings in sandal-wood, and the filligree of Trichinopoly; the inlaid work of Mooltan and Bombay, are up to this hour the marvels of the world. The hills of Western India, over the space of five thousand square miles, are penetrated by hundreds of caves, approaching in size, in richness, and beauty of architectural decoration, the finest cathedrals in Europe. These have been hewn out, in absence of the aid of gunpowder, and fashioned, without natural adjunct or addition of masonry, into their present form, covered with rich and elaborate sculptures by the hand of man. The caves are grouped together, so as to furnish places of worship, halls of instruction, and domiciles for the professors and their pupils, exactly on the plan of the universities which came into existence in Europe two thousand years after those of India were forgotten; indicating an amount of civilisation and a demand for knowledge in the East twenty-four centuries ago, such as scarcely exists in these regions in modern times. On passing down to a later age, there is the huge mountain of Aboo, 5000 feet high, covered and surmounted by one vast mass of temples, constructed from the seventh century of our era down to the present date. The ruined city of Beejapor contained sixteen hundred mosques. The hills of Paulitana are literally crusted over with temples of the finest Arabesque, cut in the hardest stone. The dome of the Mausoleum of Ibrahim Adil Shah is a third larger than that of St. Paul's; the mosque to which it belongs is 450 feet in length, and 150 in breadth; while the Taj-Mahal of Agra, the monument erected by the Emperor Jehangheer over his wife, 'the light of the harem,' built of the purest white marble, and inlaid with the richest mosaic, stands unrivalled among the mausoleums of the world. The ruins of desolate cities point to the greatness of the empire before Europeans sought its shores as traders, and seized its soil as conquerors. Gour, the former capital of Bengal, covers an area of seventeen square miles, and once boasted of a population of above a million of inhabitants. Bejapor, while flourishing, contained nearly a million of inhabited houses, occupied by more than three millions of people. Rajmahal, the city of a hundred kings, is now a miserable village inhabited by a few paper-makers."



FOUNTAIN IN THE NAVAL.

Surely then the architecture and sculpture of India are entitled to a court, where some of its monuments might be restored. On industrial and commercial grounds it has also powerful claims to this distinction. Since the Great Exhibition of 1851, "the carving of its woodwork, the patterns, colours, and texture of its carpets, shawls, and scarfs, admired for centuries, have been sent forth as patterns for the most skilled artificers in Europe to imitate." The looms of Dacca decorated the noblest beauties of the court of Augustus Cæsar; and so fine were the muslins that they were known as "running water," and "nightly dew," because, when wet, they were scarcely distinguishable from either. The Wootz steel is still so excellent, as to be used mainly for surgical instruments in England. Now India is not only remarkable for its antiquity, but for its existing products; and as a British possession it is invested with the liveliest interest. We could not spare any of the courts now constructed, but we are sure that one devoted to ancient and modern India would be a most acceptable addition.

The Crystal Palace has not yet responded to the commercial expectations of the proprietary. The original capital of £500,000 has been increased to £1,000,000, and £300,000 more is wanting to complete the building and grounds. There must therefore have been a great error in judgment in framing the original estimates. The £5 shares rose to £9, but since have receded below par.

However, the attractiveness of the Palace ought not to be tested by the past, the fountains and gardens being yet in a very unfinished state. If capital be available, the institution is capable of indefinite improvement from year to year. However, it may be doubted whether it will ever become popular in the comprehensive sense of that term; the eye of the millions may be astonished, perhaps pleased, at the magnificence of the courts, but few among them will comprehend their details. To appreciate many of those courts requires an amount of learning—nay, of profound erudition—which is very rare even among the upper classes of society, and which the working classes, from want of means and leisure, can never hope to attain. Even the most learned among us are still disputing about ancient dynasties and ancient races; nor do they agree about the chronology of empires that have disappeared. These matters are, and will remain, mysteries to the millions; and when the first emotions of wonder are satisfied by a view of the monuments of antiquity, they will cease to be attractive, because they will not be understood. To the bulk of the population, the great and permanent charm will be the Park, its gardens, lakes, and fountains, the noble terraces, and the splendid prospect which presents itself in every direction. As a Temple of Science and Art, the Crystal Palace deserves to be regarded as a national undertaking; as a commercial speculation, it is very doubtful whether it will realise the expectations of its projectors.

FINE ARTS' COURTS.

THE ASSYRIAN COURT.

THE origin of nations is buried in obscurity, and it has been a favourite recreation with men of learning to investigate their rise, progress, and fall. Assyria and Babylonia, Chaldaea and Egypt, Ethiopia and Persia, have exhausted the erudition and ingenuity of modern inquirers. Various systems of chronology have been constructed. Speculation has busied itself in determining the sites of ancient cities. Laborious efforts have been made to classify the dynasties who ruled in the early abodes of the human race. If perfect success has not rewarded these researches, the cause of failure must be sought for in the difficulty of the task, for Germany, France, and England, have devoted the energies of their most gifted intellects to solve the complicated problem. The earliest records of the primitive generations of the earth are contained in the Bible, but these are scanty. Herodotus, the father of history, did not visit Assyria till about two centuries after the destruction of Nineveh. Of the writings of the Chaldaean, Berosus, nothing but a fragment remains; and the work of the physician, Ctesias, founded on Babylonian annals, is in a great degree deemed apocryphal. Much knowledge, however, has been transmitted to us from Greece and Rome, and of these materials the best use has been made by the scholars of modern Europe, who have subjected the whole to a minute criticism, in which they have been aided by the discoveries and observations of more recent travellers. Bricks, slabs, and cylinders, inscribed with certain characters, had long been familiar to scholars as monuments of Assyria, Babylonia, and Persia, and were suspected to contain hidden secrets; but the difficulty was to interpret those characters. These remains of antiquity were fairly presumed to belong to the countries in which they were found; and, could they be decyphered, it was confidently hoped that they would throw an historical light on the people by whom they had evidently been prepared. It is an old remark, and one apparently of universal application, that when great emergencies arise men are found equal to the crisis. It has been so politically, socially, mechanically, at memorable epochs; and the present age has produced scholars who have conquered the obscure forms both of the hieroglyphics of Egypt, and of the arrow-headed or cuneiform characters of Assyria, Babylonia, and Persia. As the strata of the earth, like to the leaves of a book, have revealed its chronology to geologists, so have the inscriptions on bricks, slabs, and cylinders, disclosed to Grotefend and Lassen,

Dr. Hincks and Colonel Rawlinson, the long-concealed enigmas of Nineveh, and Babylon, and Persepolis.

There are some sceptics who absolutely deny the accuracy of the cuneiform readings, while many others, less hostile, yield a reluctant assent to their authenticity, simply because the feat appears to them impossible. The writer of an article in the *Quarterly Review* for March, 1847, says, "The more, in truth, we consider the marvellous character of this discovery, the more we feel some mistrust and misgiving returning to our minds. It is no less, in the first place, than the creation of a regular alphabet of nearly forty letters out of what appears, at first sight, confused and unmeaning lines and angles; and secondly, the creation of a language out of the words formed by this alphabet; and yet so completely does the case seem to be made out that we are not in the least disposed to retract, or even to suspend, our adhesion to Professor Lassen or Colonel Rawlinson." A little reflection will indeed dispel the first impulses to incredulity. What is our own alphabet but a succession of lines straight, curved, and circular? In the K and Y we have even the very wedges which compose the cuneiform characters. To a person who cannot read, our alphabet appears an enigma, or an absurdity. However, as in the instruction to be derived from the Assyrian Court, and from a study of the books of Mr. Layard and Mr. Fergusson, much depends on the faith reposed in the genuine interpretation of the inscriptions, we will endeavour in a familiar form, to shake, if not wholly to remove, the doubts that may remain on the minds of our readers, by placing before them the following well-known riddle:—

"Three parts of a cross and a circle complete;
Two semicircles a perpendicular meet;
Next a triangle that stands on two feet;
Two semicircles and a circle complete."

Now the riddle as here announced is one of mathematical figures, and the solution requires that they should represent certain letters in the English language; and, in truth, they make up the word "tobacco." So it is with the cuneiform characters. They too are alphabetical signs, and when the value of each is known, the interpretation is easy, and the problem is solved. Of course it was difficult at first, and so is a riddle; but learning, ingenuity, and perseverance, have triumphed over all difficulties.

Professor Grotefend, of Göttingen, was the first scholar who



studied this intricate subject, and the result of his earliest investigations was published in 1805. A more ample account of his method of procedure was given to the world in 1825. From an investigation of the cuneiform writing on the walls of Persepolis, he arrived at the two following translations:—"Darius, the great king, the king of kings, the king of nations, the son of Hystaspes, the Achæmenian. It is he who has executed this sculpture." The other reads:—"Xerxes, the great king, the king of kings, the son of Darius, the Achæmenian." On the continent, this method of interpretation was ably followed up by M. Bournouf, learned in the Zend language, and by Professor Lassen, of Bonn, intimately versed in Sanscrit and the more ancient languages of Persia, who nearly completed the system.

While these discoveries were being made in Europe, Major, now Colonel Rawlinson, who held an official appointment in Persia, without being aware of the researches of Professor Grotefend, copied and deciphered the two inscriptions at Hamadan, on which the professor had experimented, and arrived at the same interpretation,—a remarkable proof of the correctness of the analysis carried on in different parts of the globe by two independent investigators, who had no communication with each other. Colonel Rawlinson next copied and deciphered the four hundred lines of the Behistan inscription, and completed an alphabet which only varied in one character from the alphabet composed by Professor Lassen. The course of Colonel Rawlinson's studies is fully explained in the tenth volume of the *Journal of the Royal Asiatic Society*.

"The epithets of cuneiform, cuneate, wedge-shaped, and arrow-headed, *tête-à-clou* (nail-headed) in French, and *keilforming* in German, have been variously assigned to it, because its component parts resemble either a wedge, the barb of an arrow, or a nail, according to the fancy of the describer. It is not improbable, however, that the original or primitive elements of the letters were merely simple lines, the wedge or arrow-head being a subsequent improvement or embellishment." Mr. Layard, from whose admirable work this passage is quoted, observes, in another passage, "The cuneiform, however, appears to have been the character in general use in Assyria and Babylonia, and at various periods in Persia, Media, and Armenia. It was not the same in all these countries; the element was the wedge, but the combination of wedges, to form a letter, differed. The cuneiform has been divided into three branches; the Assyrian or Babylonian, the Persian, and a third, which has been named, probably with little regard to accuracy, the Median. To one of these three divisions may be referred all the forms of arrow-headed writing with which we are acquainted; and the three together occur in the trilingual inscriptions containing the records of the Persian monarchs of the Achæmenian dynasty. These inscriptions are, it is well known, repeated three times on monuments of this period, in parallel columns or tablets, in a distinct variety of the arrow-headed character; and, as it may be presumed, in a different language."*

Various races dwelt in the valley of the Euphrates from the earliest known periods, sometimes victors, sometimes vanquished. This mixed population were divided into three conspicuous classes, the Chaldean and Arab, Scythians and Tartars, Medes and Persians. Their languages and dialects differed; hence arose the necessity of trilingual inscriptions, to which Mr. Layard refers, to commemorate events. On this point Colonel Rawlinson observes, that even now if a governor of Baghdad wishes to make himself intelligible to his subjects, he must issue his edict in three languages, the Persian, Turkish, and Arabic; and so it was in the days of Darius. Mr. Fergusson, who constructed the Assyrian Court in the Crystal Palace, and who is profoundly versed in Oriental architecture, confirms and illustrates this view of the subject in his instructive work on Nineveh and Persepolis. "When the history of Mesopotamia," writes Mr. Fergusson, "first opens to us, we find the Semitic family, under the name of Chaldeans and Arabs, holding supreme rule in that country. But the Medes and Persians were there also; so too, it appears, were the Scyths; but as neither of them had ruled at that period, we know little of them, and the language of the dominant class is the only one used. In the middle ages of this history, when Persia held supreme sway over these lands, the three races seem to have been considered as nearly equally independent,—at least, all the inscriptions of this period are

trilingual. One written in Persian is addressed to the Indo-Germanic races; one in Assyrian, perhaps more properly called Babylonian, as the language had, with the capital, taken that form before the extinction of the empire, was addressed to the Semitic races; the third, which, only partially deciphered as yet, is understood to be a Tartar tongue, was addressed to the Scythians."

What the primeval language has excited much discussion, but that such a language existed we know from the first verse of Genesis xi.: "And the whole earth was of one language and of one speech." From the same authority we learn, that the Confusion of Tongues followed the attempt to build the Tower of Babel. As it is impossible to suppose that any race of men would have attempted to build a structure which should reach to heaven, as the text of Genesis states, some commentators have supposed that the real offence committed was a premature attempt at centralisation, in consequence of which the multitudes assembled in the Plain of Shinar were dispersed, it being the will of God that the whole earth should be populated. It has been remarked that the descendants of Shem, who went into Chaldaea, had no part in erecting the tower, and therefore were permitted to retain the primeval language which Noah had preserved, and transmitted to Shem and his sons. Mr. Vaux cites the following opinion of Bishop Patrick; that Nimrod's settlement at Babel was not till after the Dispersion, and that as the builders of Babel were descendants of Ham, and the children of Shem were not guilty of the offence, so the latter were not involved in the punishment, and therefore retained unchanged the primeval tongue, which, from the family of Heber, obtained in after times the name of Hebrew. Dr. Hales, collecting the opinions of Sir William Jones from his various writings, considers that there were three primeval languages, the Arabic, the Sanscrit, and the Slavonic, and that from these various dialects were formed. The Assyrians, Arabs, and Jews, according to these authorities, used a language derived from the Arabic or Chaldean, while from the Sanscrit spring the Greek, Latin, and Celtic dialects, and blended with another idiom, the Persian Armenian and the old Egyptian or Ethiopic. Now the trilingual inscriptions in cuneiform characters belong to the princes of Persia, and as Persian is a living language, though not identical with that which obtained under the Achæmenian dynasty, nevertheless there is such a degree of resemblance that scholars have had facilities in interpreting the Persian column, which they have not enjoyed in regard to the Assyrian and Babylonian columns. Mr. Layard is of opinion that the primitive Babylonian "is the most intricate variety of the cuneiform yet discovered."

The historical uses of this wonderful discovery are most important. Already they have corroborated in various instances the truth of Scripture, and thrown a new light on the habits and exploits of the people inhabiting the banks of the Euphrates and Tigris; and, as the study of these apparently mystic characters is more extensively prosecuted, the sphere of our knowledge will be increased, and none can predict its limits. As a specimen of what has already been effected, we subjoin a few passages in the history of Darius, translated by Colonel Rawlinson from the rock inscriptions at Behistan.

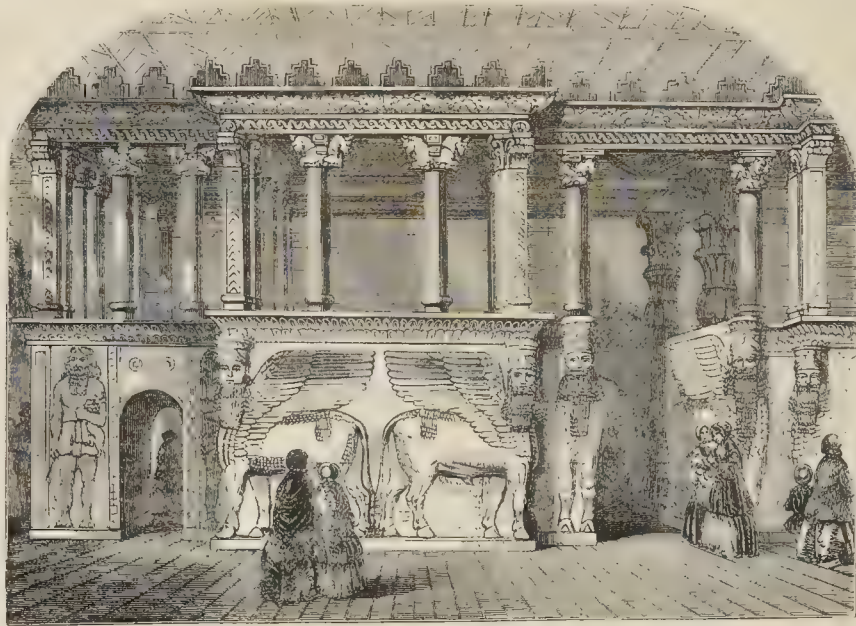
"I am Darius the king, the great king, the king of kings, the king of Persia, the king of the (dependent) provinces, the son of Hystaspes, the grandson of Arsames, the Achæmenian. Says Darius the king, My father was Hystaspes; the father of Hystaspes was Arsames; the father of Arsames was Ariyaramnes; the father of Ariyaramnes was Teispes; the father of Teispes was Achæmenes. Says Darius the king, There have been eight of my race who have been kings before me; I am the ninth. For a very long time we have been kings. Says Darius the king, By the grace of Ormazd I am king; Ormazd has granted to me the empire. Says Darius the king, These are the countries which have fallen into my hands, by the grace of Ormazd I have become king of them, Persia, Susiana, Babylonia, Assyria, Arabia, Egypt; those which are of the sea, Sparta and Ionia; Armenia, Cappadocia, Parthia, Zarangia, Asia, Chorasnia, Bactria, Sogdiana, the Sacæ, the Sattagydes, Arachosia, and the Mecians, the total amount being twenty-three countries."

In this curious passage, the error of Herodotus, who makes Darius an elective king, owing his throne to the neighing of his horse, is corrected. We see in it the piety of the Persian monarch, who attributes his power to Ormazd, or to the Almighty. His

* Nineveh and its Remains, p. 167, vol. ii.

pedigree is minutely traced, and we recognise him as the undisputed ruler of the Asiatic world. We know from other sources that about the year 606 B.C. Nineveh was captured and destroyed by Cyaxares, King of Persia and Media, aided by Nabopolassar, King of Babylon; and that Babylon succumbed to the arms of Cyrus the Great, when the whole of these once mighty empires fell under the sceptre of the Persian kings, as confirmed in the rock inscriptions of Behistan. The latest period of Assyrian history connected with these inquiries is the Achæmænian, extending from the accession of Cyrus, B.C. 560, to the death of Alexander, B.C. 323. Immediately preceding this is the Median period, from Arbaces, B.C. 821, to Cyrus, B.C. 560. The next is called the Lower Assyrian period, from Ninus, B.C. 1341,

thick, were constructed of sun-dried bricks; while the alabaster, cut into slabs, was used as panelling. On each brick was inscribed the name, title, and descent of the king who undertook the work. Since the method of interpreting the cuneiform writing has been discovered, these inscriptions clearly prove to whose reigns the different structures are to be attributed. Winged bulls and lions of colossal size guarded the entrances, and these animals had human heads. These lions are about ten feet and a half square, beautifully executed; and the vigour displayed in the body and limbs, the muscles and bones, shows that the Assyrian sculptors had a correct knowledge of anatomy. Expanded wings spring from the chest; the head is bearded, covered with a conical cap, smooth on the top,



FRONT OF THE ASSYRIAN COURT.

to Arbaces, B.C. 821. Beyond this we have the older Assyrian empire, from Nimrod, about B.C. 2200, to Ninus, B.C. 1341. According to Mr. Fergusson, the old or north-west palace at Nimroud represents the age of Nimrod; the palaces of Khorsabad and Kouyunjik, that of Ninus and his successors; the south-west palace at Nimroud, the age of the Arbacidæ; while the palace at Persepolis belongs wholly to the Achæmænian age—a history of Art extending through two thousand years.

A variety of circumstances determine the early architecture of a country, and modify it as civilisation progresses. The nature of the materials within reach is the first consideration, and next, probably, the quality of the tools by which those materials may be fashioned. Much also depends on the level or mountainous character of the land. The principal settlements of the Assyrians were located on the flat alluvial plains of the Tigris and Euphrates, "unbroken by a single eminence until they approach the foot of the Armenian hills." Granite and marble were wanting, but the tenacity of the soil, when mixed with straw, was well adapted to the manufacture of bricks, which soon hardened when exposed to the action of the sun. Such bricks, accordingly, formed the building materials of the Assyrians, who raised their palaces and temples on elevated platforms, to give them a more imposing character, and a commanding prospect over the surrounding plains. In these regions, however, a coarse kind of alabaster abounded, not difficult to work, and it was used for sculptured slabs. We learn from Mr. Layard that the walls of the chambers, from five to fifteen feet

and an ear-ring is suspended from the ear. The bulls are rather larger than the lions, but they have neither the human ear nor ear-ring; nor have they bands round the loins, which the lions have. That these animals were religious symbols there can be no doubt, but what they were specially designed to indicate may be open to much dispute. "They" (the Assyrians), says Mr. Layard, "could find no better type of intellect and knowledge than the head of man; of strength, than the body of the lion; of rapidity, than the wings of the bird." This is an ingenious solution, if these animals were intended to be symbols of the Supreme Being. There is no doubt that the early religion of the Assyrians was Sabeism, or astro-theology—that is, the worship of the sun, the planets, the signs of the zodiac, and the extra-zodiacal constellations. Now, the four cardinal points, marking the equinoxes and the solstices, were special objects of veneration; and in earlier times Taurus occupied the vernal equinox, and Leo the summer solstice, which may be the reason why these two animals make so prominent a figure in the Assyrian palaces and temples. The wings may denote the rapidity of the sun's annual passage through the twelve signs; and the band or circle round the lion may refer to the circuit of the solar year, when its commencement was dated from Leo.

There are also in the Assyrian Court figures of winged men who attend upon the king, and these are described as priests or deities. At Passargade, the ancient palace of Cyrus the Great, is a pier 15 feet in height, on which is sculptured the figure of a man with four wings, and on his back a strange, symbolical group of almost purely

Egyptian design, over which is the usual inscription, "I am Cyrus the king, the Achaemenian." Referring to this sculpture, and observing that where the winged bulls are not used it is either the hawk-headed Ormazd, or figures with four wings, which form the jambs of the portals, Mr. Fergusson asks "whether the winged, kingly figures at Nineveh should not be considered as the embodiment of the souls of departed kings, attendant on their successors on earth?" and then remarking that the "Passargadean sculpture is evidently a literal translation of the Assyrian ones, and, either being explained, the other becomes intelligible," states—"My own impression is, that they represent deceased kings."

The chambers in the Assyrian palaces were narrow in proportion to their length. The most elaborately ornamented hall at Nimroud was only 35 feet broad, though its length exceeded 160 feet. This narrowness is adduced as evidence that the art of constructing roofs requiring other support than that afforded by side walls was unknown, at least in the earliest buildings. Remains of beams, however, have been discovered; but being of wood they have crumbled away. On this point, Mr. Layard observes, "that the only trees within

easily decay, and will not bear exposure; it is not surprising, therefore, that beams made of them should have entirely disappeared after the lapse of 2500 years." The principle of the arch was known to the Assyrians; but there are no remains of windows, so that daylight could only have entered from the roof. Drains were used, and appear beneath almost every chamber in the older palace of Nimroud. According to Mr. Layard, "these were

connected with the floor by a circular pipe of baked clay, leading from a hole generally cut through one of the pavement slabs in a corner of the room. They joined one large drain, running under the great hall, and from thence into the river, which originally flowed at the foot of the mound."

When Mr. Layard published *Nineveh and its Remains*, he was of opinion that the Assyrians did not use the column except of wood, because he had discovered no remains of shafts or capitals, and concluded that its use could not be distinctly referred to any period prior to the Greek occupation; nevertheless, he gave a drawing of a fishing pavilion, found



WINGED BULL.



WINGED MAN.

the limits of Assyria sufficiently large to furnish beams to span a room 30 to 40 feet wide, are the palm and the poplar; their trunks still form the roofs of houses in Mesopotamia. Both

* Nineveh and Persopolis, p. 354.

on a bas-relief in the sculptures of Khorsabad, the façade of which is embellished by two columns, which he recognises as the prototype of the Ionic. However, all doubt is now removed on this point; for since Mr. Layard's volumes were written, Mr. Hormuzd Rassan, who is now superintending the excavations at Nineveh, has discovered a sculpture representing a palace, in which the column is introduced resting upon winged bulls and lions. In the restoration of the Assyrian Court in the Crystal Palace, Mr. Fergusson has introduced the column, but not from any remains of Assyrian architecture. He has copied the palaces of Persopolis and Susa, and with excellent judgment; for it is known that when the Persians had established their rule, they adopted Assyrian arts and civilisation, and followed their method of constructing temples and palaces.

All the ancient writers describe the walls of Assyrian and Babylonian cities as of extraordinary height and thickness, the materials being sun-dried bricks. This massiveness was evidently designed as a defence against hostile attack. In the time of Sardanapalus, Nineveh sustained a siege of three years against the combined armies of Persia and Babylonia; and Cyaxares only captured it after the river had overflowed its bed, and carried away part of the wall. Its walls are said to have occupied the labour of 140,000 men during eight years. According to Xenophon, the walls of Mespila were 50 feet high, and as many broad. Josephus states that Nebuchadnezzar built three walls round the interior and three round the exterior of Babylon. These ancient cities were not like those of modern Europe, for within their circuit were cultivated fields, sufficiently ample to supply the inhabitants with food. Works of this magnitude and strength appear almost fabulous; but it was not in the east alone that such marvels were created; and as comparisons are interesting and instructive, we may be excused a slight deviation from our immediate subject by referring to the Peruvian fortress of Cuzco. It is thus described by Mr. Prescott:—"The fortress, the walls, and the galleries were all built of stone; the huge blocks of which were not laid in regular courses, but so disposed that the small ones might fill up the interstices between the great. They formed a sort of rustic work, being rough-hewn except towards the edges, which were finely wrought; and though no cement was used, the several blocks were adjusted with so much neatness, and united so closely, that it was impossible to introduce even the blade of a knife between them. Many of these stones were of vast size, some of them being fully 38 feet long by 13

broad, and 6 feet thick. We are filled with astonishment when we consider that these enormous masses were hewn from their native bed, and fashioned into shape by a people ignorant of the use of iron; that they were brought from quarries from four to fifteen leagues distant, without the aid of beasts of burden; were transported across rivers and ravines, raised to their elevated position on the sierra, and finally adjusted there with the nicest accuracy, without the knowledge of tools and machinery familiar to Europeans. Twenty thousand men are said to have been employed in this great structure, and fifty years were consumed in the building."* We have quoted this passage to show that massiveness and grandeur of building were not confined to the people dwelling in the valley of the Tigris and Euphrates, on the banks of the Nile, or in India; and though we readily bestow our admiration on the colossal lions and bulls of Assyria, carved out of grey limestone, let it be remembered that the Peruvians gave higher proof of their consummate skill. "Among the remains of the monuments of Cannar," says Mr. Prescott, "may be seen movable rings in the muzzles of all animals, all nicely sculptured of one entire block of granite." This is the more astonishing, as they did not know the use of iron. The tools they used were of stone, but more frequently of copper mixed with tin. With these they hewed porphyry and granite, even emeralds. This composition of metals, which imparted the temper of steel, has never been discovered by civilised Europeans.

Sculptured in alabaster, on the walls of the Assyrian palaces, were representations of battles and sieges, of the chase of lions and bulls, and of the ceremonials of religion. Royal processions exhibited the king sometimes on foot, sometimes in a chariot, now hunting, now receiving prisoners. The flooring of alabaster slabs recorded the titles, genealogy, and achievements of the monarch. In this manner the chronicles of the empire were preserved; and it appears that these magnificent structures were not only palaces but temples. The sculptures were painted in gorgeous colours, for the people understood the art of extracting dyes from vegetables; nor is it wonderful, in the lapse of time, if such colours have disappeared. M. Flandin detected traces of yellow ochre on the bas-reliefs of Khorsabad; and in that palace M. Botta observed paint on the draperies, on the flowers carried by the winged figures, on the harness of the horses, on the chariots, and the trees. Flames from burning houses and the glare of torches were coloured red. According to Mr. Layard the bright blue of the Assyrian monuments appears to have been a purer oxide of copper, resembling an ore of that mineral found in an ancient mine of Kurdistan.

Among the most remarkable monuments exhumed at Nimroud are the winged figures, having a human body and the head of an eagle. Sometimes two of them appear on the same sculpture, a sacred tree being interposed between them. Each figure holds in one



EAGLE-HEADED AND WINGED FIGURES.

hand a pine cone, and in the other a square utensil, resembling a small basket. The eagle has always been recognised in all the old mythologies as a bird consecrated to the Supreme Being; and, among the Sabeists, especially to the sun, because it was supposed to gaze at the sun in its most effulgent blaze with unshrinking eye. Among the Persians it was sacred to Ormazd, to whom Darius attributes his regal glory in the inscriptions of Behistan. The pine cone, on account of its inflammability, was the emblem of fire, which they

worshipped. No doubt the square basket was symbolical, but of what is very uncertain. The tree was a sacred sign, and may be traced to the most remote antiquity. It is found in all religions, however diverse. Why hesitate to refer it to the tree of the Garden of Eden? Surely a knowledge of it was handed by tradition from Noah to his descendants; perhaps many difficulties would be removed by assuming (and there is nothing but common sense in the assumption) that Noah and his sons were acquainted with the true religion transmitted to them from Adam, and taught it to their successors; and that this religion was one, pure and undivided at the time of the Dispersion of Mankind, and the Confusion of Tongues; afterwards it became corrupted, the unity of the divine nature being broken down into polytheism, and disfigured by mythological fables; nevertheless, under whatever veil disguised, all the great outlines of primitive religion may be traced in the legends of antiquity, of which we shall furnish proof when we describe the Egyptian Court.

The figure of a man strangling a lion, which he holds in his arms, is evidently the Assyrian Hercules; and we recognise him as the prototype of the Greek Hercules, one of whose twelve labours was the destruction of the lion of Nemea. The claws of the Assyrian lion are seen grasping the limbs of the giant, who lashes it with the serpent-headed scourge.

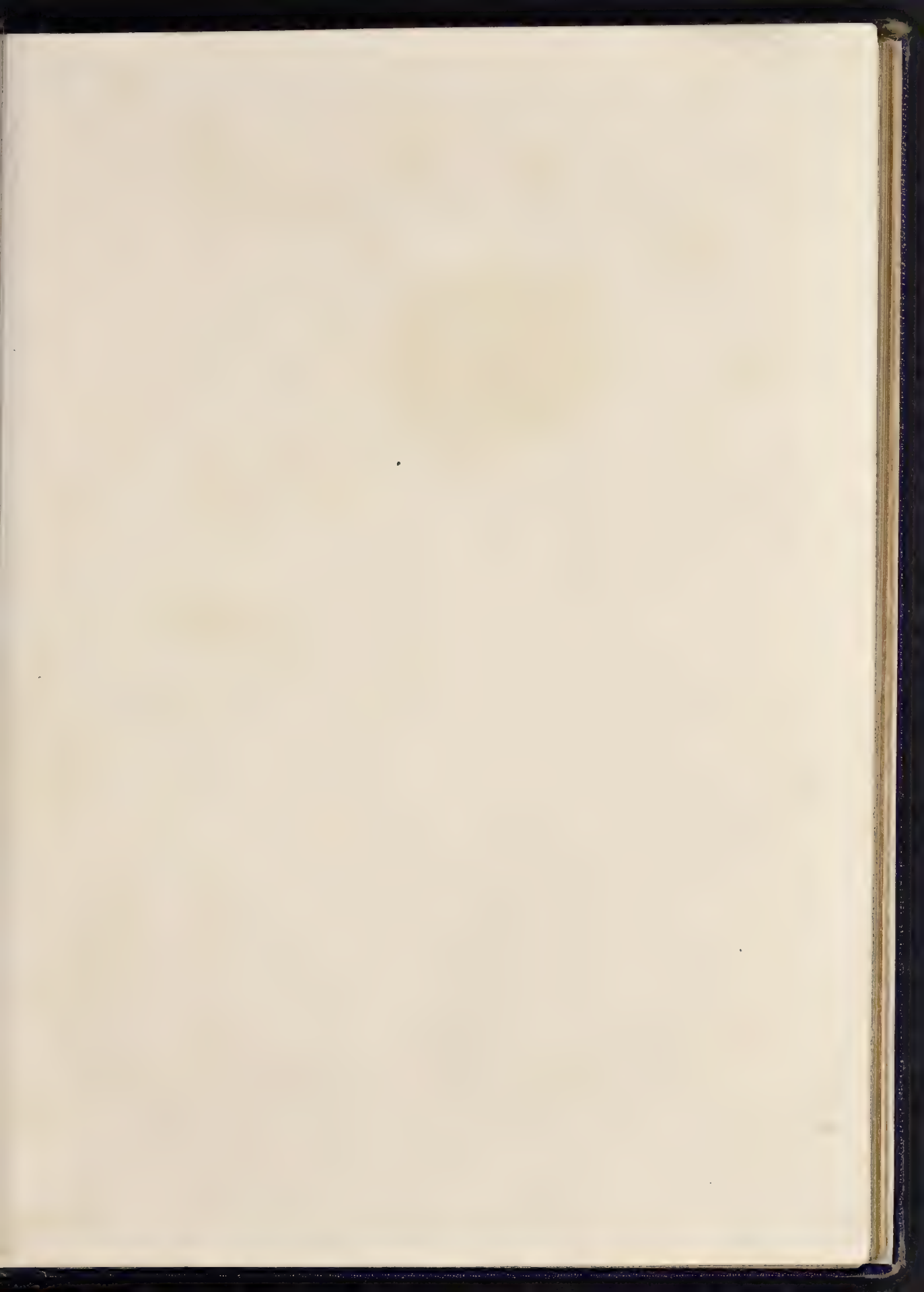
The figures of men holding in their arms the ibex or mountain-goat, most probably have reference to the zodiacal signs Aries or Capricornus; and those with monkeys on their backs appear to belong to some foreign country conquered by the Assyrians. The winged figure in a circle, with a bow in his hand, seen over the head of the king in battle, seems to indicate the tutelary genius of the empire; while the eagle-headed man is supposed to be the god Nisroch, in whose temple Sennacherib was slain; and this explanation or conjecture is the more feasible as in certain Eastern languages "Nisr" signifies an eagle.

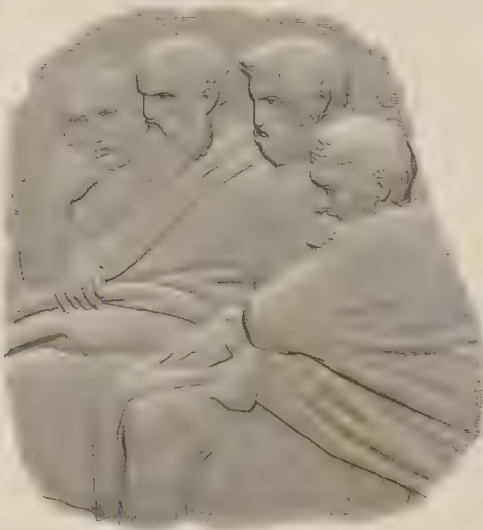
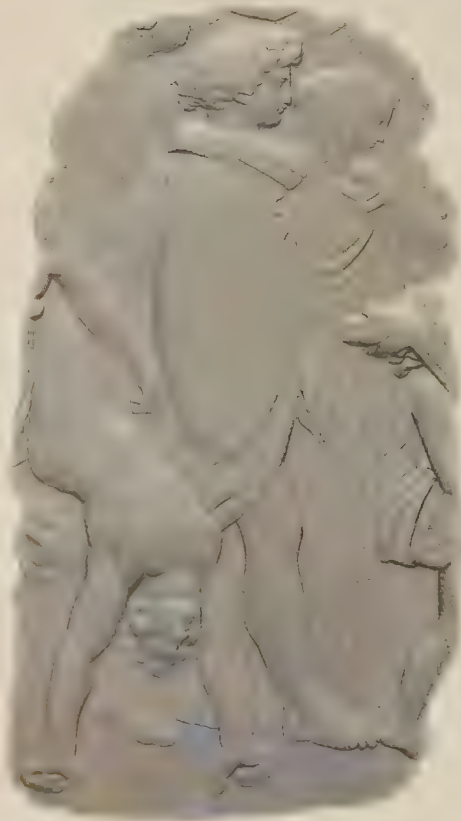
The bas-relief we have engraved represents the siege of a city. In the centre is the battering-ram, which the besieged are endeavouring to neutralize by seizing it with chains lowered from the walls, while the besiegers strive to keep it in its place with hooks. Bows and arrows are the principal weapons used by both parties. A large shield protects the warriors, as that of Ajax protected Teucer at the siege of Troy. At the left are seen soldiers undermining the fortifications. Men wounded or slain are falling from the ramparts, on which stand women wringing their hair.

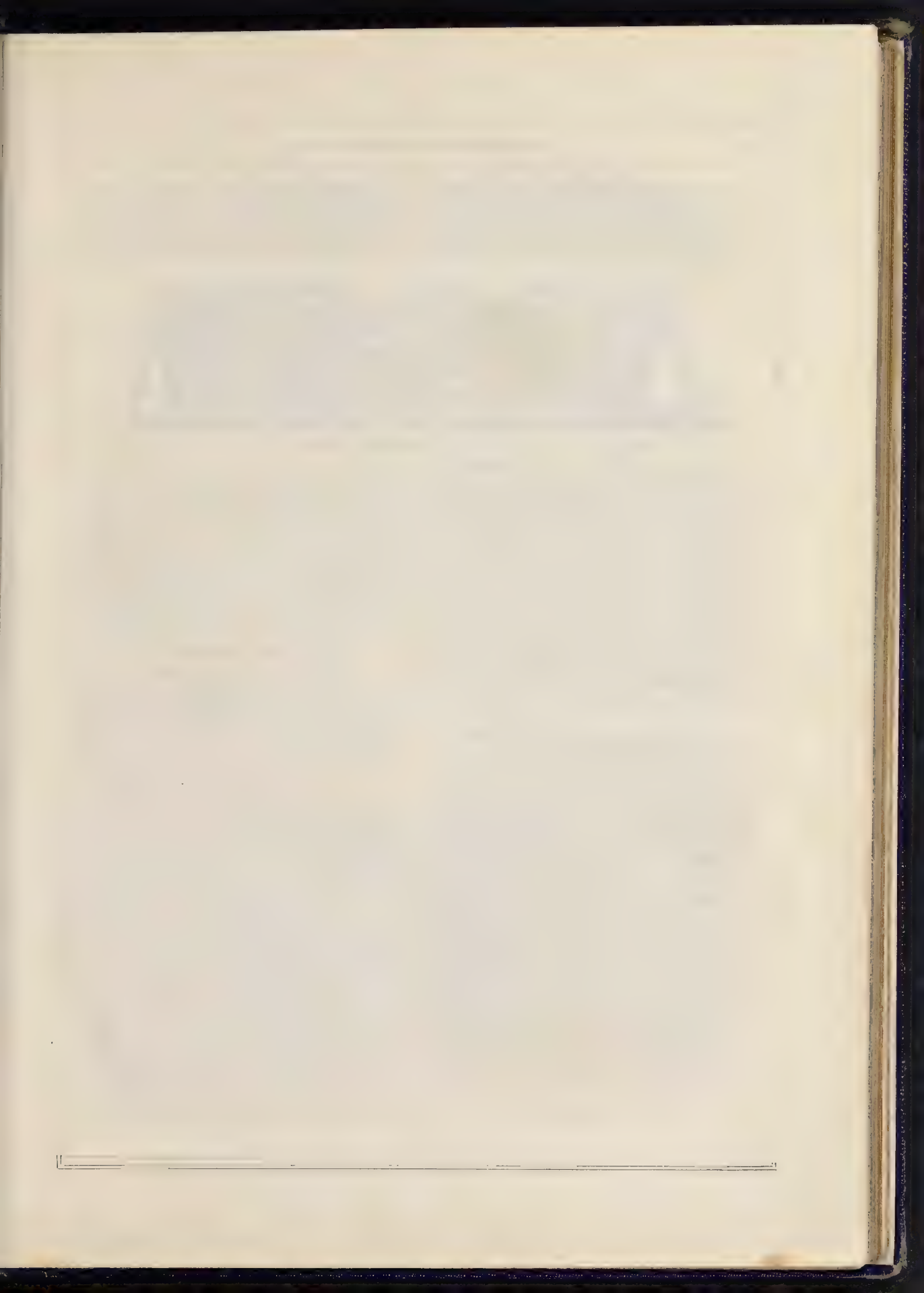
The monuments of Assyria, both painted and sculptured, evince, as Mr. Layard observes, "a knowledge of design, and even of composition, indicating an advanced state of civilisation;" and he adds, "it is very remarkable that the most ancient ruins show this knowledge in the greatest perfection attained by the Assyrians." He particularly notes the bas-relief of the lion-hunt, in the British Museum, as a good illustration of the earliest school of Assyrian Art, which exceeds the sculptures of Khorsabad, Kouyunjik, and the later palaces of Nimroud in the vigour of the treatment, the elegance of the forms, and in what the French aptly term *mouvement*." This decline in art was not peculiar to Assyria, being equally observable in Egypt and Persia, Greece and Rome; and it is difficult to account for retrogression where we should expect progress. It has been suggested that in the earliest age of a nation the artists faithfully copied nature, while their successors copied the models transmitted to them; but this rather evades than solves the problem, for it may fairly be presumed that the first efforts in art were not perfect, but that time was necessary for successive improvement. Others imagine that before Ninus founded the Assyrian Empire, the arts may have flourished under some other people whose name has perished, and that their models were imitated by the earliest Assyrian school. Scholars deeply versed in chronology may fix upon some initial starting point as the commencement of authentic history, but the actual and positive beginning must always be open to controversy; for who can affirm where tradition terminates and recorded annals commence? Moreover, considering the extraordinary discoveries made by M. Botta and Mr. Layard, which have disclosed the works of buried generations, have we not the strongest reason to hope that their successors may discover other monuments, which will throw a blaze of light on what is now doubtful or obscure?

Sir Gardner Wilkinson, in his excellent work on ancient Egypt, has some remarks on this subject which deserve every attention.

* Conquest of Peru, vol. i. p. 17, 4th Edition.







"Egypt," he observes, "was long the dominant nation, and the intercourse established at a very remote period with other countries, through commerce or war, carried abroad the taste of this the most advanced people of the time; and so general seems to have been the fashion of their ornaments, that even the Nineveh marbles present the winged globe, and other well-known Egyptian emblems,

interpretation is taken. Secondly, though no clue is afforded as to the subsequent history of this first Assyrian prince, it is quite clear that his name has been thus prominently mentioned because he was, at the time in which he lived, above all others a remarkable person, and one whose great deeds fitted him for peculiar selection; not impossible, for some such reason as Sir Walter Raleigh has



BAS-RELIEF REPRESENTING THE SIEGE OF A CITY.

as established elements of Assyrian decorative art. This fact would suffice to disprove the early date of the marbles hitherto discovered, which are in fact of a period comparatively modern in the history of Egypt; and recent discoveries have fully justified the opinion I ventured to express when they were first brought to this country: 1st, that they are not of archaic style, and that original Assyrian Art is still to be looked for; 2nd, that they give evidence of the decadence not the rise of art; and 3rd, that they have borrowed much from Egypt, long the dominant country in power and art, and will be found to date within 1000 B.C. This, however, is far from lessening their importance; for the periods they chiefly illustrate—those of Shalmaneser and Sennacherib, so closely connected with Hebrew history, give an interest to them which the oldest monuments of Assyria would fail to possess."

HISTORICAL REMARKS.

THE recent discoveries, considered in a strictly historical point of view, are of the deepest importance to a Christian people, as they illustrate and confirm the accounts recorded in Scripture; and we may reasonably expect that, as the researches are continued, many difficulties still remaining will disappear. We propose, therefore, rapidly to trace the outlines of the great catastrophes which subverted the ancient kingdoms once flourishing in the valleys of the Tigris and Euphrates: and this plan of historical treatment will be observed, in a greater or less degree, as we examine the various courts of the Crystal Palace.

We learn from Genesis x. that Nimrod, described as a "mighty hunter before the Lord," was the founder of the cities of Babel, Erech, Accad, and Calneh, in the land of Shinar; and the verses immediately following state, that "Out of that land went forth Asshur, and builded Nineveh, and the city Rehoboth, and Calah, and Resen between Nineveh and Calah." Many commentators object to this reading, contending that it was Nimrod himself who went forth to Asshur, meaning Assyria, and there built Nineveh. In this sense he was the founder of four Babylonish and four Assyrian cities. Others, interpreting Asshur as the name of a man, and not of a country, regard him as one of the lieutenants of Nimrod. Some biblical critics have denounced Nimrod as a rebel against God, accusing him of being the chief promoter of the Tower of Babel; to which it is answered that, were this true, his name would have been MMRD, or Mamred, which signifies to "rebel," and not NMRD, or Nem-Red, which means "he whose royal actions correspond to the good odour of his fame." As a "mighty hunter," he has also been considered "as a great landed proprietor," and, in this sense, king of the cities he founded. On these points Mr. Vaux makes the following interesting remarks:—

"In the first place, it is evident that the oldest cities in these countries were Babel, Erech, Accad, and Calah, in that part which was afterwards called Babylonia; and Nineveh, Rehoboth, Calah, and Resen, in Assyria Proper; of the first four no founder is mentioned, while the building of the remaining four is attributed either to Nimrod himself or to his lieutenant, according to which

given, that Nimrod was the first to abolish the simple system of paternity or eldership, and to lay the earliest foundations of independent sovereign rule. Whoever he was, it is evident that he was no common man; and the names of the cities attributed to him prove, as we shall subsequently show, that his power must have been very great. It is not therefore strange that many attempts should have been made to identify Nimrod with some of the heroes of classical antiquity, and that it should have been supposed by some that he is the same as the Greek, Ninus; by others, as Belus (the Greek form of Bael or Lord). In the traditions of his own country he is considered to be the same as Orion; and the Assyrians associated him with the hare and the dog in that constellation, preserving thereby a curious record of the mighty hunter of the Scripture narrative. Mr. Cullimore, in his work on Babylonian Cylinders, has engraved one in which divinities are represented standing on a dog, behind which are eight stars. Mr. Selden mentions that, in the constellation of Orion, Nimrod is known under the appellation of Al Kabir (the mighty); and Bochart has imagined, not without some reason, that the story of the Indian Bacehus is a classical tradition of the conquests of Nimrod and his successors."

It is impossible to fix a date to the origin of Nineveh, as it must have been founded in the ante-historic period, and, at first, could not have been more than a village or hamlet. Mr. Layard, judging from the very opposite character of the sculptures and sacred symbols discovered in the ruins, has come to the conclusion that there must have been two distinct epochs in Assyrian history, at which the country was inhabited by different races. Some chronologists have fixed the epoch of Nimrod at 2300 or 2200 B.C., and that of Ninus at 1311 and 1200 B.C.; but in these dates there is of course more of speculation than authenticity. It is, however, clearly ascertained that the site of Nineveh was on the Tigris, near the delta formed where the Zab flows into the river. The same darkness which hangs over the origin of Nineveh enshrouds that of Babylon; nor have all the resources of modern erudition determined even its site. This complete extinction accords with the prophecy of Isaiah xlii.: "It shall never be inhabited, neither shall it be dwelt in from generation to generation: neither shall the Arabian pitch tent there; neither shall the shepherds make their fold there. But wild beasts of the desert shall lie there; and their houses shall be full of doleful creatures; and owls shall dwell there, and satyrs shall dance there." This melancholy end is also foretold by Jeremiah li., who says: "And they shall not take of thee a stone for a corner, nor a stone for foundations; but thou shalt be desolate for ever, saith the Lord." At different periods Nineveh and Babylon had the ascendancy, and the supremacy of the one was based on the subjugation of the other.

From the time of Amraphel, King of Shinar, mentioned in Genesis xiv., a period of about a thousand years elapses, of which no records exist. Then appears Pul, King of Assyria, who invaded

* Nineveh and Persepolis, p. 7. By W. S. W. Vaux.

Judæa in the reign of Menahem, about 770 B.C. "And Pul the King of Assyria came against the land; and Menahem gave Pul a thousand talents of silver, that his hand might be with him to confirm the kingdom in his hand. And Menahem exacted the money of Israel, even of all the mighty men of wealth, of each man fifty shekels of silver, to give to the King of Assyria. So the King of Assyria turned back, and stayed not there in the land." (2 Kings xv. 19, 20.) In the same chapter (ver. 29) it is further stated, that Tiglath Pileser, King of Assyria, invaded Israel during the reign of Pekah, and having subdued many districts, which are enumerated, carried the inhabitants captive to Assyria. This Assyrian king again appears when invited by Ahaz, King of Israel: "And Tiglath Pileser, King of Assyria, came unto him, and distressed him, but strengthened him not." (2 Chronicles xxviii. 20.)

Shalmaneser, the Sargon of Isaiah, succeeded Tiglath Pileser, and was himself succeeded by Sennacherib, curious descriptions of whose history have been discovered by Colonel Rawlinson, a specimen of which we transfer to these pages, because it illustrates the manner in which the old monuments corroborate the Bible. We learn from 2 Kings xviii., that Sennacherib "came up against all the fenced cities of Judah, and took them." He demanded and received from King Hezekiah three hundred talents of silver and thirty talents of gold. The inscriptions referred to give the following version of this transaction in the words of Sennacherib:—"Because Hezekiah, King of Judæa, did not submit to my yoke, forty-six of his strong-fenced cities, and innumerable smaller towns which depended on him, I took and plundered; but I left to him Jerusalem, his capital city, and some of the inferior towns around it. The cities which I had taken and plundered I detained from the government of Hezekiah, and distributed between the Kings of Ashdod, Ascalon, Ekron, and Gaza; and having thus invaded the territory of those chiefs, I imposed on them a corresponding tribute over that to which they had been formerly subjected; and because Hezekiah still refused to pay me homage, I attacked and carried off the whole population, fixed and nomade, which dwelt round Jerusalem, with thirty talents of gold and eight hundred talents of silver, the accumulated wealth of the nobles of Hezekiah's court, and of their daughters, with the officers of his palace, men slaves and women slaves. I returned to Nineveh, and I accounted this spoil for the tribute which he refused to pay me." There is a difference in the weight of the silver, but in all other points the inscriptions and the Bible agree.

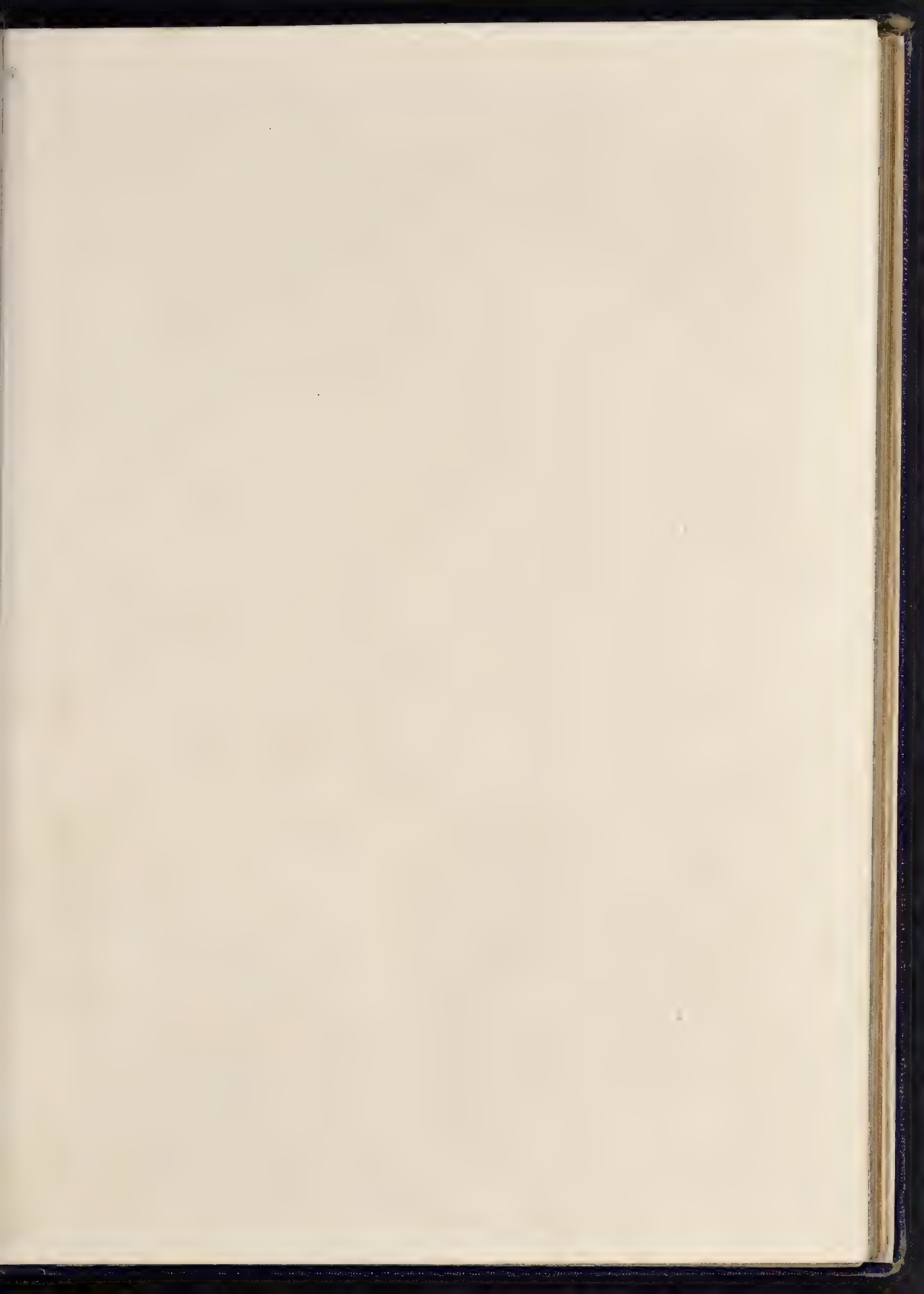
The ambition of Sennacherib coveted supreme rule over Judæa, and he prepared a large army for its invasion; but Hezekiah refused to submit, having faith in the protection of God. The Assyrian

king sent him a blaspheming letter, in which he scoffed at such protection; and then we are told "it came to pass that night that the Angel of the Lord went out, and smote in the camp of the Assyrians an hundred fourscore and five thousand, and when they arose early in the morning, behold they were all dead corpses." Sennacherib then returned to Nineveh, and was slain, though not immediately, by two of his sons, while he was worshipping in the Temple of Nisroch. The murderers escaped into Armenia, and Esarhaddon, his son, reigned in his stead. It was at this period that the Babylonians, Medes, and other tributary nations, asserted their independence. Esarhaddon did not recover Babylon till the thirtieth year of his reign, but the Medes were never again brought under his yoke. His grandson, Nabuchodonosor, after the resources of the Assyrian empire had been recruited, marched into Media, and gained a complete victory over Arphaxad, otherwise called Phraortes, the Median king who was slain at the battle of Rhages. After his triumph, he feasted at Nineveh for one hundred and twenty days, and invaded Judæa, and his general Holofernes sustained a signal defeat. Assyria never recovered that disaster. Nabopolassar threw off the yoke and assumed regal power at Babylon; and in the year 606 B.C. he united his army with that of Cyaxares, the son of Phraortes, and the allies captured and destroyed Nineveh. Thus terminated the Assyrian empire.

In the sixth chapter of Mr. Layard's work on Nineveh and Babylon, the readers will find some highly interesting details of the wars of Sennacherib, recorded in the cuneiform inscriptions decyphered by the learned and ingenious Dr. Hincks. The inscriptions begin with the name and titles of Sennacherib, who styles himself "the subduer of kings from the upper sea of the setting sun (the Mediterranean) to the lower sea of the rising sun (the Persian Gulf)." His various campaigns are narrated from year to year. These discoveries identify him with the king who built Kouyunjik. "Had the name stood alone," observes Mr. Layard, "we might reasonably have questioned the correctness of the reasoning, especially as the sign and monograms with which it is written are admitted to have no phonetic power; but when characters whose alphabetic values have been determined from a perfectly distinct source, such as the Babylonian column of the trilingual inscriptions, furnish us with the names in the records attributed to Sennacherib, written almost identically as in the Hebrew version of the Bible, such as Hezekiel, Jerusalem, Judah, Sidon, and others, and all occurring in one and the same paragraph, their reading moreover confirmed by synchronisms, and illustrated by sculptured representations of the events, the identification must be considered as complete."



MOVING THE BULL.





THE CRYSTAL PALACE EXPOSITION





THE EGYPTIAN COURT.

THE primitive history of Egypt is recorded on its monuments. In comparatively recent times its hieroglyphics have been deciphered, and its religious emblems interpreted. The names of the builders of the pyramids have been discovered; but it is evident that the country must have been inhabited, and a regular form of government established, before those gigantic structures could have been erected. Of that ante-historical epoch, of which not even the vagueness of tradition remains, nothing is known. Manetho, an Egyptian priest who wrote in the third century B.C., drew up from Egyptian authorities a catalogue of kings who reigned over his country, and arranged them in thirty dynasties. Modern researches have, in a great degree, confirmed the fidelity of his narrative, the names of those kings having been traced on monuments now preserved in the British Museum. It is still, however, an open question whether those dynasties were partly contemporaneous or successive: some kings ruling at Thebes, others at Memphis—a circumstance very important in settling a point of chronology. The celebrated Herodotus has transmitted to posterity many instructive facts relating to Egypt, which he visited; and considerable information has been handed down to us by Diodorus Siculus. Other Greek authors, as well as Roman authors, have largely contributed to our stock of knowledge. Modern Egyptologists have thrown a flood of

narrative of discoveries within the pyramids and tombs, constitutes a storehouse of research and learning. The most eminent scholars, however, still differ on points of chronology. Böckh fixes the date of Menes, the first king of Egypt, in the year 5702 B.C. The Chevalier Bunsen adopts the less remote date of 3643 B.C.; Lepsius,

Professor of Egyptian Antiquities at Berlin, prefers that of 3892 B.C.; while Mr. Fergusson proposes that of 3096 B.C., as the year in which Menes founded the Egyptian monarchy. There is an elaborate minuteness in these calculations, even down to units; but the variations between them are so marked, that it would be dangerous to accept any one of them as authentic. We may, therefore, dismiss these antiquarian speculations, and be satisfied with knowing that the Egyptians were of Asiatic origin, and of Arab or Semitic race, and are presumed to have advanced to the valley of the Nile, as conquerors, through Lower Egypt southwards.

The following summary of the chronology and history of Egypt is taken from the work of Sir Gardner Wilkinson.

"The Egyptians seem at first to have had a hierarchical form of government, which lasted a long time, until Menes was chosen king, probably between 2000 and 3000 years before our era. Menes was of THIS, in Upper Egypt; and at his death or that of his son, the country was divided into the southern and northern kingdoms, a Thinite and a Memphite dynasty

ruling at the same time. Other independent kingdoms or municipalities also started up, and reigned contemporaneously in different parts of Egypt. The Memphite kings of the third and fourth, who built the pyramids, and Ositarsen I., the leader of the twelfth or second Theban dynasty, were the most noted among them. The latter was the original Sesostris; but his exploits having been, many



COLOSSAL FIGURES OF RAMESES.

light over these inquiries. Dr. Young and Champollion have extracted the secrets of the hieroglyphics; while Sir Gardner Wilkinson has unfolded to view almost a living panorama of the old inhabitants of the valley of the Nile. The great work of Denon, and the *Égyptiaca* of Hamilton, rich in descriptions of the temples and obelisks, are replete with profound erudition; while Belzoni's

generations afterwards, eclipsed by those of Rameses the Great, they were transferred, together with the name of Sesostris, to the later and more glorious conqueror; and Rameses II. became the traditional Sesostris of Egyptian history. Ositsarsen, who seems to have ruled all Egypt as lord paramount, ascended the throne about 2080 B.C.; but the contemporaneous kingdoms continued till a new one arose, which led to the subjugation of the country, and to the expulsion of the native princes from Lower, and apparently for a time from Upper Egypt also, when they were obliged to take refuge in Ethiopia. This dominion of the shepherd kings lasted upwards of five centuries. At length, about 1530 B.C., Amasis, the leader of the eighteenth dynasty, having united in his own hands the previously divided power of the kingdom, drove the shepherds out of the country, and Egypt was henceforth governed by one king, having the title of 'Lord of the Upper and Lower country.' Towards the latter end of this dynasty, some 'stranger kings' obtained the sceptre, probably by right of marriage with the royal family of Egypt (a plea on which the Ethiopian princes and others obtained the crown at different times), and Egypt again groaned under a hateful tyranny. They even introduced very heretical changes into the religion; they expelled the favourite god, Amun, from the Pantheon, and introduced a sun-worship unknown in Egypt. This rule was not of very long duration; and having been expelled, their monuments and every record of them was purposely defaced. The kings of the eighteenth dynasty had extended the dominions of Egypt far into Asia and the interior of Africa, as the sculptures of Thotmes, the Amunophs, and others show; both Sethos and his son Rameses II., of the nineteenth dynasty, who reigned from 1370 to 1270 B.C., advanced them still further. The conquests of the Egyptians had been pushed into Mesopotamia as early as the days of Thotmes III., about 1445 B.C.; the strong fortress of Carchemish remained in their hands nearly all the time till the reign of Necho; and whenever the Egyptians boasted in after ages of the power of their country, they referred to the glorious era of the eighteenth and nineteenth dynasties. Rameses III., of the twentieth dynasty, also carried his victorious arms into Asia and Africa about a century after his namesake, enforcing the tributes levied by Thotmes III. and his successors from many countries that formed part of the Assyrian empire. But little was done by the kings who followed him until the time of Sheshouk (Shishak), who pillaged the Temple of Jerusalem, and laid Judea under tribute 971 B.C. The power of the Pharaohs was on the decline; and Assyria, becoming the dominant kingdom, threatened to wrest from Egypt all the possessions she had obtained during a long course of conquest. Tirhaka (Tehrak), who with the Sabacos composed the twenty-fifth Ethiopian dynasty, checked the advance of the Assyrians, and forcing Sennacherib to retire from Judea, restored the influence of Egypt in Syria. The Saite kings of the twenty-sixth dynasty continued to maintain it, though with doubtful success, until the reign of Necho, when it was entirely lost; for soon after Necho had defeated and killed Josiah, King of Judah, the King of Babylon smote his army in Carchemish, and took from the Egyptians all that pertained to the King of Egypt from the boundary torrent on the Syrian confines under the river Euphrates. No permanent conquests of any extent were henceforth made out of his land by the Egyptian king; and though Apries sent an expedition against Cyprus, defeated the Syrians by sea, besieged and took Gaza and Sidon, and recovered much of the influence in Syria which had been taken from Egypt by Nebuchadnezzar, these were only temporary successes; the prestige of Egyptian power had vanished; it had been found necessary to employ Greek mercenaries in the army; and in the reign of Amasis another still greater power than Assyria or Babylon arose, to threaten and complete the destruction of Egypt. In the reign of his son Psammenitus, 525 B.C., Cambyses invaded the country, and Egypt submitted to the arms of Persia. Several attempts were made by the Egyptians to recover their lost liberty; and, at length, the Persian garrison having been overpowered, and the troops sent to reconquer the country having been defeated, the native kings were once more established 414 B.C. These formed the twenty-eighth, twenty-ninth, and thirtieth dynasties; but the last of the Pharaohs, Nectanebo II., was defeated by Ochus, or Artaxerxes III., 340 B.C., and Egypt again fell beneath the yoke of Persia. Eight years after this Alexander the Great liberated it from the Persians, and Ptolemy and his successors once more erected it into an independent kingdom,

though governed by a foreign dynasty, which lasted until it became a province of the Roman empire."

Of all the nations of antiquity Egypt is the most remarkable for the permanent influence it has exercised on human intellect and human progress. Frederick Schlegel considers that the peculiar bearing and ruling element of the Egyptian mind was its scientific profundity.* It sought to penetrate into the depths and mysteries of nature, even into their most hidden abyss. The necessities of its geographical position compelled it to study the exact sciences. The annual inundation of the Nile, by removing boundaries and giving rise to litigious disputes, led to the study of mensuration; and as the supply of food depended on the height to which the waters rose, Nilometers were invented, and yearly registers of the flood were kept to serve as the statistics of comparative dates. Their monuments attest their astronomical knowledge. In medicine they were learned, and the art of embalming the dead is peculiarly Egyptian. Their power of cutting and transporting to very great distances enormous blocks of granite, still astonishes modern engineers. If they were deficient in agricultural implements, it was because the soil needed little culture. In ship-building they made little progress, for they held the sea in religious abhorrence. However, in all the natural sciences they were the teachers of the Greeks; and Pythagoras and other eminent scholars studied in their schools. From them Plato derived the rudiments and outlines of his most sublime speculations. They established the doctrine of the immortality of the soul and of a future life. Their laws of debtor and creditor have excited the admiration of modern jurisconsults. Such was their intellectual superiority that the highest praise bestowed on the legislator of the Jews was, that Moses was "versed in all the science of the Egyptians;" and many of his precepts which related to subsistence, diet, and health, were derived from those who had taught him during the captivity.

The key to the mysteries of Egypt is their religious system, which was Sabeism or astro-theology. In common with every other invention, it arrived at maturity by slow gradations; it had its infancy, its manhood, and its old age. In its primitive character it was a rude system of astronomy made subservient to the purposes of agriculture, and the earliest calendars were mere manuals of husbandry, and perhaps also of meteorology. The astronomer was a sage, and also an astrologer, and, in process of time, became a priest. The religious sentiment is implanted in man; it is part and parcel of humanity, inseparable from its nature and essential to its existence. It is an indestructible principle. Man has never felt himself independent of the external and invisible world; he has never fancied his own unaided powers sufficient to secure his happiness: on the contrary, he has always been conscious of his inability to secure pleasure or avert pain, and has never ceased to entertain a feeling, however vague, crude, or indistinct, of his entire dependence on some unknown and superior intelligence. Now it is this consciousness of individual weakness, common to universal humanity, that creates the religious sentiment; and as this consciousness has always existed, and ever must exist, so long as man preserves his present nature, religion may be said to be indestructible in its *essence*, however it may vary in its *development*. The cosmogonies and theogonies of heathenism—the sacred fables and mythologies, dogmas, mysteries, and ceremonies, were certainly the inventions of the priesthood; and they adapted them to the people among whom they ministered. But sacerdotal corporations never created the religious sentiment; it was the religious sentiment that brought those corporations into existence.

It may be impossible to fix at any specific date the origin of the priestly institutions of Egypt. In the earliest stage of society, when men were hunters or fishers, they may not have existed; perhaps we may imagine faint traces of them in the next, or shepherd state; but there is a high probability that they were not later than the agricultural era, when the stellar observations of the shepherds began to be recorded. Sabeism, or astro-theology, is among all the varieties of heathenism the most natural to man, who, unaided by revelation, must necessarily have formed his ideas of religion on some system of materialism, before he could realise in his mind ideas of spiritualism. Now, there is no object in nature so calculated to excite astonishment, admiration, and reverential awe,

* Philosophy of History, p. 166. Bohn's Edition.

as the magnificent spectacle of the star-spangled heavens, producing, on the one hand, the most exalted notion of the Creator and Governor of the universe, and on the other, the most humiliating conviction of human insignificance. This contrast must have forced itself on the minds of men in all countries; and the obvious conclusions drawn from it must have precisely accorded with the religious sentiment. Hence, astronomy became a sacred as well as a physical science, and formed the chief study of the ancient priesthood. Then it was taught that the destinies of individuals and of nations depended on the stars. Heroic worship transferred the benefactors of mankind into the constellations whose names they still bear. Gods and goddesses were enthroned in the celestial sphere. Animals, vegetables, and minerals, were intimately connected with the signs of the zodiac, the luminaries without its belt, and the planets. Such was the scope, character, and object of ancient heathenism; a system originally based on astronomy, disfigured in its progress by astrology, teaching its doctrines in the form of solar, lunar, and stellar allegories, and maintaining its discipline by mysteries and initiations, descriptive and explanatory of the physical government of the universe.

As scientific knowledge increased, and the priesthood became more speculative, new dogmas were invented. Then the theory of the active and passive causes of nature was taught; a belief in the existence of two rival deities was inculcated; the celestial hierarchy was equally distributed under the banners of the two competitors; one being attached to the principle of light and good, the other to the principle of darkness and evil. Such were the Osiris and Typhon of Egypt. The influences attributed to the four elements—fire, air, water, and earth—were respectively arranged as allies or opponents of the two belligerent powers; birds, beasts, fishes, insects, were invested with similar antagonistic functions; in short, all animate and inanimate nature was allegorised, and the various phenomena of nature embodied and personified in astro-theological fables. The doctrine of mere materialism succumbed under the growing intelligence of mankind; the globe became a huge animal endowed with vitality: it next received a universal intelligence: at last the philosophy of Egypt triumphed, and established a belief in the doctrine of a universal soul, pre-existent, immortal, and accountable in a future state.

The extent of Egypt was limited, compared with the celebrity it acquired. According to Sir Gardner Wilkinson, it chiefly consisted of the narrow slip of land between the Mediterranean and the first cataract—about seven degrees and a half of latitude. "For," says that accomplished writer, "with the exception of the northern part about the Delta, the average width of the valley of the Nile between the eastern and western hills is only about seven miles, and that of the cultivable land scarcely more than five and a half—being in the widest part ten and three quarters, and in the narrowest two miles, including the river; and that portion between Edfou and Asouan, at the first cataract, is still narrower, barely having room for any soil, so that those sixty miles do not enter into the general average. The extent of square miles of the northernmost district, between the pyramids and the sea, is considerable; and that of the Delta alone, which forms a portion of it, may be estimated at 1976 square miles; for though it is very narrow about its apex at the junction of the modern Rosetta and Damietta branches, it gradually widens on approaching the coast, where the base of this somewhat irregular triangle is eighty-one miles. And as much irrigated land stretches on either side east and west of the two branches, the northern district, with the intermediate Delta included, will be found to contain about 4500 square miles, or double the whole arable land of Egypt, which may be computed at 2255 square miles, exclusive of the Fyoom, a small province consisting of about 340. The limits of Egypt were the Mediterranean to the north, and Syene or the cataracts to the south; and the cultivated land east and west of the Nile contained within this space, or between the latitude $31^{\circ} 37'$ and $24^{\circ} 3'$, was all that constituted the original territory of the Pharaohs; though the Mareotis, the Oases, the Nitriotic, and even part of Lybia, were attached to their dominions, and considered part of their country."

The builded area on this small surface, as stated by the ancient historians, is scarcely credible. According to Herodotus, twenty thousand populous cities existed in Egypt during the reign of Amasis; while Diodorus computes the number at thirty thousand under Ptolemy Lagus, which still remained when he wrote, about

forty-four years before our era. The population, when most numerous, is generally computed at seven millions; but in the time of Diodorus, it had declined to three millions.

Egypt was divided into *Nomes* or *Prefectures*, the total of which, in the time of Sesostrius, amounted to thirty-six; they were afterwards increased to fifty-three. In the principal city of each nome, some animal was specially consecrated; for though, with rare exceptions, the sacred animals received a general adoration throughout the whole country, yet they were treated with particular reverence in those places in which they held the rank of a tutelary guardian. Thus, Apis, the luni-solar bull, had his temple at Memphis; Mnevis, the solar bull, at Heliopolis; the lion, at Leontopolis; the wolf, at Lycopolis; the dog, at Cynopolis; the goat, at Mendes; the crocodile, at Ombos; the fishes, at Oxyrinthus; the eagle, at Philæ; the hawk, at Tentyra; the serpent, at Epidauros; the ram, at Thebes and Sais.

The characteristics of Egyptian architecture were simplicity, massiveness, and solidity. They built for all time. Believing as they did in the immortality and transmigration of the soul, and also that they might again return to their country when restored to a new existence, they might, as some writers have suggested, have rendered their structures durable in the hope that they would revisit them after a long interval of time. The size of the blocks they used fill us with astonishment; and modern architects and engineers would perhaps hesitate to undertake works which the Egyptians executed. The granite quarries of Syene were upwards of 130 miles from Thebes, or five times as much from Memphis; and the monoliths of that material erected in the Delta were conveyed more than eight hundred miles. "It would seem," says Mr. Hamilton, "as if our modern mineralogists had mistaken the precise character of the stone to which Pliny (l. xxxvi. c. 8) had applied the term 'Syenites.' Syenite is now said to be a species of granite made up of quartz, felspar, and hornblende, with or without mica, aggregated in different proportions, and supposed to be posterior to granite. Whereas it is plain that the Roman naturalist intended to designate by this term the common red granite found in abundance about Syene, and of which the different obelisks then in Rome and Egypt had been formed. The peculiar colour appears likewise to be ascertained, by his saying that it was formerly called *Pyrophopacilon*; and we know of no large obelisks of grey granite. Syenites, therefore, might be assumed as the genuine and classical term of the purest granite." When Mr. Hamilton visited Egypt, about the beginning of the present century, he found blocks on which the marks of chisels and drills might plainly be seen, as well as of wedges. The ground was covered with pieces of granite, unfinished obelisks, columns, sarcophagi, &c.; and one half-finished obelisk, between seventy and eighty feet long, and ten feet wide. From all the quarries roads led by regular slopes to the great plain, from which the blocks were transported to the river. The obelisks were monoliths, that is, formed of a single stone. That of Karnak is the largest in Egypt; and its weight is computed at about 300 tons. It is still standing; but was far surpassed by the granite colossus of Rameses II., which when entire weighed, according to Sir Gardner Wilkinson, 887 tons; while the stupendous monolith in the temple of Latona, at Buto, which, according to Herodotus, took 2000 men during three years to move to its place from Elephantine, weighed at least 5000 tons.

The pyramids are supposed to be the most ancient structures in Egypt; and ancient authors pretty well agree that they were erected to contain the remains of two brothers, Cheops and Cephren, kings of Egypt. They are surrounded by other smaller pyramids and burial-places; and many mummy-pits have been discovered. It is difficult, however, to believe that any one of them, especially the largest, should have been commenced and finished in a single reign. The second pyramid of Gizeh is smaller both in the base and in the elevation than the first. According to Herodotus, there is a difference of forty feet in the height; and according to Diodorus Siculus, a difference of seventy feet in the bases of the two. The three smaller pyramids, according to Diodorus, contained the bodies of the wives of Chemmis, Cephren, and Mycerinus. Pliny states that 336,000 men were employed in the erection of the great pyramid during twenty years; Colonel Vyse estimates the existing masonry at 6,316,000 tons; he discovered in the inscriptions the name of Shufu, which learned men agree to be identical with Suphis or Cheops, the builder.

M. Nouet, in his Report to the French Institute of Cairo, gives the following dimensions of the great pyramid:—

	Fr.	ft.	in.
Length	716	3	
Diagonal of the base	1013	0	
Length of the edge in its present state	636	1	
Do. when entire	676	8	
Length of the platform on the top	42	8	
Height of the pyramid in its present state	421	8	
Do. when entire	448	6	
Length of the inclined side	574	1	
Angle which the edge forms with the diagonal	41°	42'	20"
Angle which the edge forms with the base	58°	2'	20"
Inclination of the sides towards the plane of the horizon	51°	23'	46"

According to Sir Gardner Wilkinson, the total length of each face of the great pyramid when entire was from 754 to 755 feet, which would be exactly 440 cubits; but he cautiously observes, "neither this, nor the courts of the temples, the statues, and other monuments, can be depended upon for the exact length of the Egyptian measure."

Belzoni gives the following measurement of the second pyramid:—

	Eng. ft.
The basis	684
Apotome, or central line down the front, from the top to the basis	568
Perpendicular	456
Coating from the top to the place where it ends	140



PRINCIPAL ENTRANCE TO THE EGYPTIAN COURT.

Mr. Hamilton gives the following measurements of the interior:—

	Eng.	ft.	in.
Length of the chamber where the sarcophagus is	34	9	
Breadth of do.	17	4	
Height	22	0	
Length of the lower chamber	20	0	
Breadth of do.	17	0	
Height of do.	15	0	
Length of the sarcophagus	7	6	
Breadth of do.	3	6	
Height of do.	3	6	
Thickness of the sides	0	6	

Belzoni observes that not a single hieroglyphic was found in all these enormous masses; but that in one of the mausoleums, which stands on the west side of the first pyramid, he saw some hieroglyphics and figures *reversed* in one of the blocks which formed that mausoleum, as if they were to be hidden from view. "It certainly must be concluded," observes this intelligent traveller, "that this stone had been employed in a building which was adorned with hieroglyphics, and consequently proves that they were known previous to the erection of these mausoleums, though they were

without any of these ornaments and inscriptions. This being the case, it may be supposed that the people who built the pyramids were of the same way of thinking as those who built the mausoleums; consequently, nothing can be inferred respecting the age of the pyramids from the circumstance of their not having any hieroglyphics."

Dupuis, in his *Origene de tous les Cultes*, has a long dissertation on the pyramids, which he regards as solar gnomons; and others have supposed that they were built for astronomical purposes. Another opinion favours the hypothesis, that they were intended for religious ceremonies. Belzoni, alluding to these theories, says, "I will agree with others thus far, that the Egyptians, in erecting these enormous masses, did not fail to make their sides due north and south, and consequently, as they are square, due east and west. Their inclination, too, is such as to give light to the north side at the time of the solstice. But even all this does not prove in the least that they were erected for astronomical purposes; though it is to be observed that the Egyptians connected astronomy with their religious ceremonies, as we found various zodiacs, not only among the temples, but in their tombs also."

monies. They were the first to maintain the immortality of the soul; that after the death of the body, the soul always entered into that of some other animal; and when it had transmigrated through beasts, birds, fishes, and indeed all things living on the earth, in the air, and in the water, it again entered that of a man; this circuit being accomplished in three thousand years. But the Egyptians also believed in the pre-existence of the soul;—that it was born in heaven, and would ultimately return to its primeval abode under the form of Osiris. These doctrines spread to Greece and Rome; and are presented to us in a purified and philosophic form by the great thinkers of those countries. "The soul," says Scipio to his son, "has always existed, and will continue to exist, throughout all eternity. It must exercise itself in the practice of the virtues, if it desires an easy return to its native home. The actions and thoughts which ought chiefly to occupy it, are those which concern our country. It will succeed the more readily in its wishes, if, from the present moment, in which it is imprisoned in the gail of the body, it escapes from this confinement by meditating on the superior beings, and effects, as it were, a divorce from the animal senses, and soars above them. This is the price which the soul



PORTION OF THE FAÇADE TOWARDS THE NAVE.

There is an Egyptian tradition on the Deluge, connecting that event with the pyramids, which Mr. Hamilton received from Elfi Bey, at Schirment Eluah. This bey had devoted nearly all the leisure time of his life to the topic of magic and astronomy, or rather astrology, which he assiduously studied in what he called his "Book of Science." According to this book, the great pyramid of Gizeh was built by Hermus, a king of Egypt, who had predicted the Deluge, and who was at once a king, a physician, and a prophet. When the rains had begun, he shut himself up in the pyramid with his wife and family; but the waters rushed in through the wall, and destroyed them all. On which Mr. Hamilton remarks, that "it must indeed be allowed that some of the Arab fables regarding the early times of Egypt, are at least as probable, and as connected, as those recorded in the Grecian or Roman authors; and that the pyramids were built to avoid the calamities of a deluge, is as likely as that they were granaries."

It is now a received opinion that the pyramids were sepulchral buildings. The burial of the dead, and the embalming of bodies was, among the Egyptians, one of the most solemn and sacred cere-

monies. They were the first to maintain the immortality of the soul; that after the death of the body, the soul always entered into that of some other animal; and when it had transmigrated through beasts, birds, fishes, and indeed all things living on the earth, in the air, and in the water, it again entered that of a man; this circuit being accomplished in three thousand years. But the Egyptians also believed in the pre-existence of the soul;—that it was born in heaven, and would ultimately return to its primeval abode under the form of Osiris. These doctrines spread to Greece and Rome; and are presented to us in a purified and philosophic form by the great thinkers of those countries. "The soul," says Scipio to his son, "has always existed, and will continue to exist, throughout all eternity. It must exercise itself in the practice of the virtues, if it desires an easy return to its native home. The actions and thoughts which ought chiefly to occupy it, are those which concern our country. It will succeed the more readily in its wishes, if, from the present moment, in which it is imprisoned in the gail of the body, it escapes from this confinement by meditating on the superior beings, and effects, as it were, a divorce from the animal senses, and soars above them. This is the price which the soul

must pay for its regeneration. As to those who are the slaves of their passions, prone to indulge in voluptuousness and the gratification of mere corporal pleasures, and who set at naught the sacred laws of religion and the duties they owe to their fellow-citizens, their souls, when separated from their bodies, will continue here below in the visible regions of the earth, where they will be mixed up with the grosser matter; nor will they return to the heavens till after having been purified, during a long course of ages, by the various ordeals through which they will have to pass."

Human intellect was believed to be an emanation from the divine intelligence, communicated to every man as he evinced capacity for its reception, in the same way as air is breathed by all who have the power of respiration: Human intellect was of the same quality as the governing soul of the universe, and all men had a greater or less degree of the divine essence; for all souls formed part of the same spiritual element, as all the different seas, rivers, and lakes, formed part of the element of water. "The elements," says Proclus,

* Cicero, *Soma. Scip. c. 9.*

in his *Commentary on the Timæus of Plato*, "which enter into the composition of our bodies, are part and parcel of those which are in masses in the universe. It would be extraordinary that all our evil properties should be found in the external world, and that our nobler and diviner properties should not be found there also; and still more extraordinary would it be, that there should be a universal elementary matter, and not a universal soul."

The unity of action, and the tendency of all the component parts of nature towards one common centre of motion, which preserves the harmony of the whole, led those philosophers who regarded the "Great Whole" as Deity, to admit the unity of God. They considered the universe as a *grand effect*, and consequently referred its existence to a *grand cause*; and as they perceived unity in the effect, they attributed unity to the cause. "All things," says the Emperor Marcus Aurelius, "are connected together by a sacred chain, and there is not one link in it which is not allied to the whole chain; for all things have been so blended together as to form a perfect whole, on which the symmetry of the universe depends. There is but one world, and it comprehends everything; one God endued with ubiquity; one eternal matter; and one law, which is the reason common to all intelligent creatures."

The same philosophical idea may be recognised in the *Georgics*, where the poet, desiring to account for the industrious sagacity of bees, declares, "that they possess a portion of the ethereal essence, which constitutes the divine substance called the soul of the universe; that the divinity penetrates all parts of the world—the earth, the sea, and the vast heavens; that men, sheep, oxen, wild beasts, in short, everything which is born and lives, derives from this immense soul the spirit by which it is animated; that at the death of every animal, the portion of the divine essence returns back to the principle and source of life, which dwells in the lofty firmament."*

Virgil pursues the same philosophical idea in the sixth book of the *Æneid*, when Anchises passes in review before Æneas the disembodied souls of those great men who were to adorn and dignify the Roman empire. To give an air of probability to the fiction, Anchises explains the Pythagorean doctrine on the pre-existence of souls (which Pythagoras had learned from the Egyptians), their union with the body in this life, and the destiny which awaits them after the dissolution of their material tenement. "You must know, my son," says Anchises, "that the heavens, the earth, the sea, the brilliant orb of the moon, and all the stars, are animated by an eternal principle of life, which perpetuates their existence; that there is a grand intelligent soul diffused throughout all parts of the vast body of the universe, which, mixing itself up with everything, agitates it by an eternal movement. The soul is the source of life in men, in flocks and herds, in birds, and in the monsters which breathe in the ocean. The vital force which animates them is an emanation from the eternal fire, shining brilliantly in the heavens, and which, held captive in the gross matter of which bodies are formed, can only develop itself as different mortal organisations, which blunt its edge and deaden its activity, allow it to do."

These doctrines are of Egyptian origin. The famous Eleusinian Mysteries of Ceres were copied from the Mysteries of Isis. The prototype of both the Roman and the Romish purgatory is to be traced to the banks of the Nile, though differently fashioned in its details when transferred to the banks of the Tiber.

Sir Gardner Wilkinson observes that Diodorus has shown that the fables of the Acherusian Lake, of Hecate, of Cerberus, of Charon, and of the Styx, owed their origin to Egyptian ceremonies. Of Charon, it may be observed, that both his name and character are taken from Horus, who had the peculiar office of steersman in the sacred boats of Egypt; and the piece of money given him for ferrying the dead across the Styx, appears to have been borrowed from the gold and silver plate put into the mouths of the dead by the Egyptians; for though they did not intend it as a reward to the boatman, but rather as a passport to show the virtuous character of the deceased, it was of equal importance in obtaining for him admittance into the regions of the blessed. The Egyptian custom of depositing cakes in the tombs, probably led to the Greek notion of sending a cake to Cerberus, which was placed in the mouth of the deceased; and it was by means of a similar one, drugged with soporiferous herbs, and given to the monster at a hungry hour, that Æneas and the Sybil obtained an entrance into the lower regions.

* Georg. lib. 4. v. 220, *et seq.*

Embalming the dead was one of the most solemn of Egyptian practices; and of this curious usage the ancients have transmitted to us minute particulars. "In Egypt," says Herodotus, "certain persons are appointed by law to exercise this art as their peculiar business; and when a dead body is brought to them, they produce bodies of mummies in wood, imitated in painting; the most elaborate of which are said to be of him (Osiris), whose name I do not think it right to mention on this occasion. The second which they show is simpler and less costly; and the third is the cheapest. Having exhibited them all, they inquire of the persons who have applied which mode they wish to be adopted; and this being settled, and the price agreed upon, the parties retire, leaving the body with the embalmers. In preparing it, according to the first method, they commence by extracting the brain through the nostrils by a curved iron probe, partly cleansing the head by these means, and partly by pouring in certain drugs; then making an incision in the side with a sharp Ethiopian stone, they draw out the intestines through the aperture. Having cleansed and washed them with palm-oil, they cover them with pounded aromatics; and after filling the cavity with powder of pure myrrh, cassia, and other fragrant substances (frankincense excepted), they sew it up again. This being done, they salt the body, keeping it in natron during seventy days, to which period they are strictly confined. When the seventy days are over, they wash the body, and wrap it up entirely in bands of fine linen, smeared on the inner side with gum, which the Egyptians generally use instead of glue. The relations then take away the body, and have a wooden case made in the form of a man, in which they deposit it; and when fastened up, they keep it in a room in their house, placing it upright against the wall. This is the most costly mode of embalming. For those who choose the middle mode, on account of the expense, they prepare the body in the following manner:—They fill syringes with oil of cedar, and inject this into the abdomen, without making any incision or removing the bowels; and taking care that the liquid shall not escape, they keep the body in salt during the specified number of days. The cedar-oil is then taken out; and such is its strength, that it brings away with it the bowels and all the inside, in a state of dissolution. The natron also dissolves the flesh, so that nothing remains but the skin and bones. This process being over, they restore the body without any further operation. The third kind of embalming is only adopted for the poor. In this they merely cleanse the body by an ejection of *syrmæ*, and salt it during twenty days, after which it is returned to the friends who brought it. The bodies of women of quality are not embalmed directly after their death; and it is customary for the family to keep them three or four days before they are subject to that process."

Diodorus gives nearly the same account, though he mentions some particulars not recorded by Herodotus. "The funerals of the Egyptians," he says, "are conducted upon three different scales,—the most expensive, the more moderate, and the humblest. The first is said to cost a talent of silver (about £250 sterling); the second 22 minæ (or £60 sterling); the third is extremely cheap. The persons who embalm the bodies are artists who have learned this secret from their ancestors. They present to the friends of the deceased who apply to them an estimate of the funeral expenses, and ask them in what manner they wish it to be performed; which being agreed upon, they deliver the body to the proper persons appointed to that office. First, one who is denominated the scribe, marks upon the left side of the body, as it lies on the ground, the extent of the incision; then another, who is called the dissector, cuts open as much of the flesh as the law permits with an Ethiopian flint stone, and immediately runs away, pursued by those who are present, throwing stones at him amidst bitter execrations, as if to cast upon him all the odium of the necessary act: for they look upon every one who has offered violence to, or inflicted a wound or any other injury upon a human body, to be hateful; but the embalmers, on the contrary, are held in the greatest consideration and respect, being the associates of the priests, and permitted free access to the temples as sacred persons. As soon as they get together to embalm the body thus prepared for them, one introduces his hand through the aperture into the abdomen, and takes everything out except the kidneys and heart. Another cleanses each of the viscera with palm-wine and aromatic substances. Lastly, having applied oil of cedar and other things to the whole body for upwards of thirty days, they add myrrh, cinnamon, and

those drugs which have not only the power of refreshing the body for a length of time, but of imparting to it a fragrant odour. It is then restored to the friends of the deceased; and so perfectly are all the members preserved, that even the hairs, and eyelids, and eyebrows remain undisturbed, and the whole appearance of the person is so undisturbed that every feature may be recognised. The Egyptians, therefore, who sometimes keep the bodies of their ancestors in magnificent apartments, set apart for the purpose, have an opportunity of contemplating the faces of those who died many generations before them; and the height and figure of their bodies being distinguishable, as well as the character of their countenance, they enjoy a wonderful gratification in the society of those they see before them."

Belzoni, having personally inspected the tombs of Egypt, differs in many points from these two high authorities, and considers that Herodotus was not well informed by the priests. Belzoni never saw a single mummy erect, but all lying regularly in horizontal rows. He considers that the mummies of the poorer classes were dried in the sun, not having detected the slightest trace of gum on any of them. In the tombs or caves which received the bodies of the poor, our traveller found the mummies of animals intermixed with human bodies; and he enumerates bulls, cows, sheep, monkeys, foxes, bats, crocodiles, and fishes. One tomb that he opened was filled entirely with cats. Of the bull, the calf, and the sheep, there is no part but the head, which is covered with linen, the horns projecting out of the cloth. The birds are squeezed together, and lose their shape, except the ibis, which is found like a fowl ready to be cooked, and bound round with linen. Now such animals, according to Belzoni, are not to be found in the tombs of the higher class of people.

We shall here offer some remarks on the embalming and burial of these animals. It has been remarked that the religion of Egypt was strongly tinged with astro-theology, or the adoration of the stars; the stars of the zodiac, as well as those without its belt, were compared to animals from some fancied similitude, and the ancient error is recognised in modern nomenclature. The sheep or ram is the celestial Aries which marked the vernal equinox, as the bull or Taurus did at an earlier date, the change of place being due to the precession of the equinox. When Osiris, or the sun, entered these signs, he announced the opening of the spring; and when the Egyptians desired to represent that season on their temples, Osiris was painted with the head and horns either of a ram or of a bull. But now it may be asked, How did it happen that one of the tombs was full of the mummies of cats—the cat has no place among the constellations? This is true; but other reasons may be assigned for its consecration. It was specially consecrated to Isis and to Diana, both representatives of the moon, as the fables attest,—and the favourite metamorphosis of those deities was into a cat. The various forms assumed by the pupil of the cat's eye, sometimes round, sometimes oval, sometimes of an oblong figure, appeared to be a counterpart of the different phases of the moon; on account of which fanciful resemblance, the animal was dedicated to Isis. But another circumstance recommended it to the agriculturist of Egypt: it is a known destroyer of rats and mice, which commit havoc in granaries; the cat therefore was consecrated to Osiris, the good principle, as rats and mice were to Typhon, the bad principle. The ibis, another sacred animal, had no type in the heavens. This bird resembled the common stork in figure, but had a beautiful plumage. Juvenal, who appears to have been ignorant of the fundamental principles of Sabeism, speaks contemptuously of the mad Egyptians, who worshipped the crocodile and the ibis, full of black serpents.

"Crocodilon adoratur
Pars hæc, et saturam nigris serpentibus ibim."

The consecration of this bird, far from being an evidence of madness or ignorance, is a striking proof of the ingenuity of the Egyptian priesthood. The ibis was a bird of prey, living on vermin of all descriptions, but particularly on certain winged snakes, which flew from Ethiopia into Egypt at the time of harvest, destroying the corn. These pestiferous snakes or serpents were, according to the system of "Dualism," classed among the agents of Typhon, and as the ibis was their deadly enemy, that bird was regarded as an agent of Osiris, created expressly to exterminate them. Belzoni

also mentions the crocodile as found in a mummy state. He describes it "as left in its own shape, and after being well bound round with linen, the eyes and mouth are painted on this covering." The crocodile and hippopotamus were both symbols of Typhon, he having disguised himself in their forms to escape the pursuit of Orus, the son of Osiris. The consecration of these animals, being as they were representatives of the evil principle, appears at first sight to involve inconsistency and contradiction; for it may be naturally asked, Did the Egyptians venerate both good and evil? In explaining this apparent difficulty, it is to be observed that though the Serapis of Egypt, in common with the Pluto of Greece and Rome, was honoured with religious worship, yet the motives to their adoration were very different from those which prompted the worship of Osiris and Jupiter. The principle of good was held sacred from gratitude, from hope, from a lively sense of past favours, and from an expectation of future benefits; the principle of evil, on the contrary, was only revered from fear, from a sense of past unhappiness, and from the apprehension of future calamities. This is the broad line of distinction. In the special case of the crocodile, several reasons have been assigned for classing it among the sacred animals. It was a symbol of fresh potable water, particularly of the water of the Nile, whose banks were crowded with that amphibious animal. In the old hieroglyphic system, the two eyes of the crocodile signified the rising sun and a star, and the tail denoted the darkness of night. The spots on its skin indicated the starry heavens; and, having no tongue, the crocodile was in this respect a symbol of deity, who has no need of that organ to make known his will. This animal was the tutelary genius of Ombos, where it was specially adored, the people of which none detested the inhabitants of Tentyra, who had consecrated in their name the hawk, the bird of Osiris, and the supposed enemy of the crocodile—the bird being the symbol of fire, because, in common with the eagle, it can fix its unflinching gaze on the sun, while the amphibious animal was the symbol of water. On this point Mr. Hamilton observes, in his *Egyptiaca*, that "the vicinity of Ombos, on both sides of the Nile, is low and marshy. In the bed of the river, which there divides itself into two branches, are a number of low islands, some not overflowed, but consisting of barren sand. The crocodile does not remain long in the water, but likes to bask in the sun, stretched out on the sand beach. They are timid, and only become furious from hunger. They were fed by the Ombites to keep them tranquil, as they were too numerous to be extirpated. Their worship was due to their harmlessness; they were embalmed, and their mummies deposited in catacombs. Some suppose that they were consecrated as emblematic of the evil principle, whom the people wished to conciliate, as the Yezedis do to this date."

Belzoni does not subscribe to the three modes of embalming mentioned by Herodotus and Diodorus, but thinks that they all admit of further distinction. He found mummies in cases, and some without cases. Those in cases have no papyrus. "It appears to me," he observes, "that such people as could afford it would have a case to be buried in, on which the history of their lives was painted; and those who could not afford a case, were contented to have their lives written on papyrus, rolled up, and placed above their knees." The cases were generally made of Egyptian sycamore, the most plentiful wood in the country. The mummies of priests were distinctive. "The bandages are stripes of red and white linen intermixed, covering the whole body, and forming a curious effect from the two colours. The arms and legs are not enclosed in the same envelope with the body, as in the common mode, but are bandaged separately, even the fingers and the toes being preserved distinct. They have sandals of painted leather on their feet, and bracelets on their arms and wrists. They are always found with the arms across the breast, but not pressing it; but though the body is bound with such a quantity of linen, the shape of the person is carefully preserved in every limb. The cases in which mummies of this sort are found are somewhat better executed, and I have seen one that had the eyes and eyebrows of enamel, beautifully executed in imitation of nature." This passage is extracted from Belzoni (p. 171), who also observes that Egyptian linen manufactures were equal to our own; many of their garments were quite transparent, and among the folding of the mummies, he observed some cloth quite as fine as our common muslin, very strong, and of an even texture.

Connected with Egyptian burial is the Egyptian law of

* Sat. xv. v. 2, 3.

debtor and creditor—a subject curious in itself, but still more curious in its results,—for it is really the remote, though by many unsuspected foundation of purgatory, as we shall endeavour to establish. It was a stringent law among the Phœnicians that fraudulent debtors should be denied the rights of sepulture, and they held that the unburied could never enter the regions of the blessed without a long and painful purification. Whether the Egyptians adopted this creed from the Phœnicians, the most mercantile nation of antiquity, or whether they imparted it to them, or whether each nation contrived it independently of the other, must remain doubtful; but this is certain, that the object of the law was to make men honest during life from the dread of future punishment. Sir Gardner Wilkinson has so well described this code that we transfer his version to our pages.

"Bocchoris," says that writer, "who reigned in Egypt about the year 800 B.C., and was surnamed the Wise, passed a law that no contract should be binding unless reduced into writing. The person of the debtor could not be seized, but his goods might; for the person of every citizen was looked upon as the property of the state, and might be required for some public service connected with

how much more unreasonable must it be to imprison those by whom the implements were used?"

As to the denial of burial under the law of debtor and creditor, Diodorus observes that "some who were not possessors of catacombs constructed a new apartment for the purpose in their own house, and set the coffin upright against the firmest of the walls; and the same was done with the bodies of those who had been debarred the rites of burial on account of an accusation brought against them, or in consequence of debts they or their sons had contracted. These last, however, if their children's children happened to be prosperous, were released from the impediments of their creditors, and at length received the ceremony of a magnificent burial. It was, indeed, most solemnly established in Egypt that parents and ancestors should have a more marked token of respect paid them by their families after they had been transferred to their everlasting habitations. Hence originated the custom of depositing the bodies of their deceased parents as pledges for the payment of borrowed money; those who failed to redeem those pledges being subject to the heaviest disgrace, and deprived of burial after their death." This explanation seems to account for Belzoni not having



TEMPLE OF ABOOSIMBEL.

war or peace; and, independently of the injustice of subjecting any one to the momentary caprice of his creditor, the safety of the country might be endangered through the avarice of a few interested individuals. Asychis passed a law, by which it was pronounced illegal for any one to borrow money without giving in pledge the body of his father or the tomb of his ancestors; and, if he failed to redeem so sacred a pledge, he was considered infamous, and at his death the celebration of the usual funeral obsequies was denied to him, and he could not enjoy the right of burial either in the tomb, or in any place of sepulture; nor could he inter his children, or any of his family, as long as the debt was unpaid, the creditor being actually put in possession of the family tomb. The debtor and creditor law of Bocchoris was borrowed by Solon from the Egyptian code, and existed at Athens; and was, as Diodorus says, much more consistent with justice and common sense than that which allowed the creditor to seize the person, while it forbade him to take the ploughs and other instruments of husbandry. "For if," continues the historian, "it is unjust thus to deprive men of the means of subsistence and of providing for their families,

found mummies erect in the catacombs, for when placed in that position, Diodorus expressly states that they were kept in a new apartment added to the house of the family; and as to debtors, we may presume from the religious habits of the people that sooner or later their bodies were redeemed; but if there were exceptions, then they could not be found in the tombs, since they never could have received the rites of sepulture.

We now revert to the doctrine of purgatory, to which we have already alluded. To judge rightly of those who lived three thousand years ago, we should endeavour by a strong effort of mental volition to shake off our prejudices, and strive to think as they thought. What appears ridiculous to us, appeared wise to them; and we must estimate them by their own standard, not by ours. They distinguished between the material and the spiritual man. Virtue resided in the soul of the universe, a portion of which soul every man possessed, and during life it dwelt in an earthly habitation—the physical body, composed of matter. This union of soul and body was a state of trial to the soul, which was liable to be corrupted by its contact with matter. According to these

view, the earth was not the native country of the soul, but the place of its exile. It was born in the heavens, and as it never lost entire consciousness of its original dignity, it was supposed always to meditate on its lost birthright. The degradation of the soul while united with the body was metaphorically called "the loss of its wings." It lost them, or rather the use of them, by allowing them to be clogged with the viscosity of matter; but as soon as this encumbrance was removed, the soul was enabled to wing its flight back to its native heaven.

If the soul, at the moment physical life was extinct, were completely disengaged from the corruptions of matter, the dead person immediately entered Elysium; if, on the contrary, the soul was totally degraded by matter, the deceased was instantly consigned to Tartarus. Now, at death, the vast majority were neither absolutely pure or impure, and therefore were neither in a condition to be united to the principle of light, nor did they merit to be consigned to the principle of darkness. However, in these circumstances divine justice must be satisfied; consequently, it was essential that the vast majority, after death, should undergo some sort of purification. Such was the foundation of the ancient doctrine of purgatory.

Such, then, was the principle of this dogma. We proceed to the refusal of burial. When Æneas arrives at the banks of the Styx, he recognises his old pilot, Palinurus, who, having been hurled into the sea by a violent squall, swam to the coast of Italy, where he was murdered by the natives. In consequence of not having been buried, he was doomed to wander for a period of a hundred years on the margin of the river. Palinurus implores Æneas to search for his body, and give it the holy rites of sepulture, that his penance might cease. Beseeching Æneas by the memory of his father, and by the affection he bore to his only son—the most powerful appeals he could make to the feelings and sympathies of his late chieftain—the pilot exclaims:—

"Eripe me his, invicte, malis; et tu mihi terram
Injice, namque potes
Da dextram misero, et tecum me tolle per undas
Sedibus ut saltem placidis in morte quiescam."

The prayer of Palinurus was for burial. "Throw," he says, "over my body a little earth, that I may repose tranquilly in the grave." To wander on the Styx for a hundred years was to be in purgatory; and it is here remarkable that the punishment he was enduring



THE RAMSEION, THEBES.

tory, two thousand years probably, or certainly one thousand years, before it was adopted by the Roman Catholic Church.

In the old system, purification from sin in this assumed intermediate state of existence was effected by three processes. Fire, water, and air purify matter; and as vice was held to be matter, or of the nature of matter, those three elements were employed to effect that lustration of the body, without which none but the perfectly pure could enter into Elysium. The ancient purgatory was accordingly divided into three departments. "For slight offences, the body of the delinquent was opened, and swung backwards and forwards in air; the second class of criminals were plunged into water; and the most deep-rooted impurities were eradicated by fire." This ancient dogma is expressly mentioned by Virgil. We subjoin the original translated in the previous sentence.

"Ergo exorcetur penis; veterumque malorum
Supplicia expendunt; alim panduntur inanes
Suspense at ventos; aliis sub gurgite vasto
Infectum eluunt scelus, aut exuritur igni."*

* Æneid. lib. 6. v. 739, et seq.

was not inflicted for any crime that he had himself committed, but for the omission of a ceremony, over which he had no control. Such a sentence was as cruel as unjust, and it is only to be explained by referring to the original law of Phœnicia and Egypt, which refused burial to the dishonest debtor. In process of time this particular law was forgotten, but tradition handed down its substance, and it was applied indiscriminately by succeeding generations, who were ignorant of its original and limited design.

It has already been shown in the extract from Diodorus that the Greeks derived the materials for constructing their fables on the shades below from the Egyptians; and also from the Egyptians they, and the Romans after them, received their notion of purgatory. Thus, Plato contended that no soul could be completely purified until it had undergone three distinct incorporations with matter; an opinion, according to Beausobre, adopted by the Jews.* The dogma of transmigration was another form of purgatory; and it was almost universally recognised in the eastern world. Among

* Hist. du Manichisme, t. 2. p. 495.

the Brahmins it influenced, more or less, every transaction in life. "Deprived as we are," says Schlegel, "of the old books and original writings of the Egyptians, we are unable perfectly to comprehend and seize their peculiar ideas on this subject, and state them with the same assurance as we can those of the Indians, whose ancient writings we now possess in such abundance, and which in all main points perfectly agree with the accounts of the ancient classics. But we are left to infer the ideas of the Egyptians on the metempsychosis only from their singular treatment of the dead and the bodies of the deceased; from that sepulchral art (if I may use the expression) which with them acquired a dignity and importance, and was carried to a pitch of refinement, such as we find among no other people; from that careful and costly consecration of the corpse, which we still regard with wonder and astonishment in their mummies and other monuments. That all their solemn preparations, and the religious rites which accompanied them, that the inscriptions on the tombs and mummies had all a religious meaning and object, and were intimately connected with the doctrine of the transmigration of souls, can admit of no doubt; though it is a matter of greater difficulty to ascertain with precision the peculiar ideas they were meant to express. Did the Egyptians believe that the soul did not separate immediately from the body which it had ceased to animate, but only on the entire decay and putrefaction of the corpse? or did they wish by their art of embalment to preserve the body from decay, in order to deliver the soul from the dreaded transmigration? The Egyptian treatment of the dead would certainly seem to imply a belief that, for some time at least after death, there existed a certain connexion between the soul and body. Yet we cannot adopt this supposition to an unqualified extent, as it would be in contradiction with those symbolical representations that so frequently occur in Egyptian Art; and in which the soul immediately after death is represented as summoned before the judgment-seat of God, severely accused by the hostile demon, but

defended by the friendly and guardian spirit, who employs every resource to procure the deliverance and acquittal of the soul. Or did the Egyptians think that by all these rites, and by so many magical expedients, they would keep off the malevolent fiend from the soul, and obtain for it the succour of good and friendly divinities?"

The pyramids have suggested these general remarks on the religious institutions of the Egyptians; and if an adverse criticism complains that they have been carried to too great a length, the answer is, that the Crystal Palace is not a mere panorama, but a school of instruction. The feelings of wonder and admiration may be excited by a simple contemplation of the restored buildings of antiquity, but much more is desired than the mere gratification of the eye. A student should know the inner life of a people who have left behind them such wondrous monuments, and that knowledge is not to be gleaned from a mere survey of its architecture; for though there may be "sermons in stones," the mind requires a certain preparation before the teaching can be appreciated. We pass on to some of the most memorable

MONUMENTS OF EGYPT.

The Egyptian Court of the Crystal Palace is approached from the nave by an avenue of lions, east from a pair known as Lord Prudhoe's Lions, which that nobleman (the present Duke of Northumberland) brought from Egypt. The originals are in the British Museum. The façade of the Court towards the nave is a reproduction of a portico of the Ptolemaic era; and here it may be well to observe that the monuments represented in the Crystal Palace are selections, as space was wanting to give any single one entire, and the object has been to convey an idea of the state of Egyptian Art in the Pharaonic, Ptolemaic, and Roman periods. On the frieze above the columns at the entrance is the following hieroglyphic inscription:—



In cartouches or rings between the frieze, are the names of her Majesty and Prince Albert, also in hieroglyphic characters.

The capitals and columns of this façade are imitated from a variety of Egyptian monuments, and their arrangement from the

portico of the Temple of Edfu, the finest structure now existing of the age of the Ptolemies. According to Belzoni, the propylæon, or entrance to the Temple of Edfu, is the largest in Egypt. On the side wall of the pronaos is the figure of Harpocrates, seated on

a full-blown lotus, his finger on his lips, exactly as he is represented in the minor temple at Tentyra. What is worthy of note at Edfu is the figure of a unicorn on the west side of the wall; and Belzoni observes that the figures of beasts are very rare on these monuments. The elephant is only to be seen at the entrance to the Temple of Isis, at Philæ; the horse, as a hieroglyphic, is on the northern exterior wall at Medinet Aboo; and the camelopard, on the wall of the sekos, or interior of the Memnonium, and on the back of the temple at Ermentis. At Edfu the figure of Typhon is placed on the capitals, in the same manner as are the heads of Isis at Tentyra.

THE TEMPLE OF ABOO-SIMBEL.*—This represents the façade of a temple, excavated from the solid rock, in Nubia. It was first discovered by Burekhardt buried in the sand, and afterwards uncovered by Belzoni, Mr. Beechey, and Captains Irby and Mangles. It is situated under a rock about a hundred feet above the Nile, facing the south-east by east, and about one and a half day's journey from the second cataract in Nubia, or Wady Halfa. According to Belzoni, it is the finest and most extensive excavation in Nubia, except the tomb in Behan el Malook; and we transfer his description of it to our

pages:—"We entered at first into a large pronaos, fifty-six feet long and fifty-two wide, supported by two rows of square pillars, in a line from the front door to the door of the sekos. Each pillar has a figure, not unlike those at Medinet Aboo, finely executed, and very little injured by time. The tops of their turbans reach the ceiling, which is about thirty feet high; the pillars are five feet and a half square. Both these and the walls are covered with beautiful hieroglyphics, the style of which is somewhat superior, or at least bolder than that of any others in Egypt, not only in the workmanship, but also in the subjects. They exhibit battles, storming of castles, triumphs over the Ethiopians, sacrifices, &c. In some places is to be seen the same hero as at Medinet Aboo, but in a different posture. Some of the columns are much injured by the close and

heated atmosphere, the temperature of which was so hot that the thermometer must have risen to 130°. The second hall is about twenty-two feet high, thirty-seven wide, and twenty-five and a half long. It contains four pillars about four feet square; and the walls of this also are covered with fine hieroglyphics in pretty good preservation. Beyond this is a shorter chamber, thirty-seven feet wide, in which is the entrance into the sanctuary. At each end of this chamber is a door, leading into smaller chambers, in the same direction with the sanctuary, each eight feet by seven. The sanctuary is twenty-three feet and a half long, and twelve feet wide. It contains a pedestal in the centre, and at the end four colossal sitting figures, the heads of which are in good preservation, not having been injured by violence. On the right side of this great hall, entering into the temple, are two doors, at a short distance from each other, which lead into long separate rooms; the first thirty-eight feet ten inches in length, and eleven feet five inches wide, the other forty-eight feet seven inches by thirteen feet three. At the end of the first are several unfinished hiero-

glyphics, of which some, though merely sketched, give fine ideas of their manner of drawing. At the lateral corners of the entrance into the second chamber from the great hall is a door, each of which leads into a small chamber, twenty-two feet six inches long, and ten feet wide. Each of these rooms has two doors, leading into two other chambers, forty-three feet in length, and ten feet eleven inches wide. There are two benches in them, apparently to sit on. The most remarkable subjects in this temple are:—1st. a group of captive Ethiopians, in the western corner of the great hall; 2nd. the hero killing a man with his spear, another lying slain under his feet, on the same western wall; 3rd. the storming of a castle, in the western corner from the front door. The outside of this temple is magnificent. It is a hundred and seventeen feet wide, and eighty-six feet high; the height from the top of the cornice to the top of the door being sixty-six feet six inches, and the height of the door twenty feet. There are four enormous sitting colossi, the largest in Egypt or Nubia, except the great Sphinx at the pyramids, to which they approach in the proportion of nearly two-thirds. From the shoulder to the elbow they measure fifteen feet six inches; the ears three feet six inches; the face seven feet; the

beard five feet six inches; across the shoulders twenty-five feet four inches; their height is about fifty-one feet, not including the caps, which are about fourteen feet. There are only two of these colossi in sight, one is still buried under the sand, and the other, which is near the door, is half fallen down, and buried also. On the top of the door is a colossal figure of Osiris, twenty feet high, with two colossal hieroglyphic figures, one on each side, looking towards it. On the top of the temple is a cornice with hieroglyphics, a torus and frieze under it. The cornice is six feet wide, the frieze is four feet. Above the cornice is a row of sitting monkeys, eight feet high, and six across the shoulders. They are twenty-one in number. This temple was nearly two-thirds buried under the sand, of which we removed thirty-one feet before we came to the upper part of the door. . . .



RAMSES II. SEATING AN ARAB CHIEF.

I must not omit to mention that, in the temple, we found two lions with hawks' heads, the body as large as life, a small sitting figure, and some copper-work belonging to the doors."

The hero killing a warrior with his spear, another lying slain under his feet, is represented in our engraving.

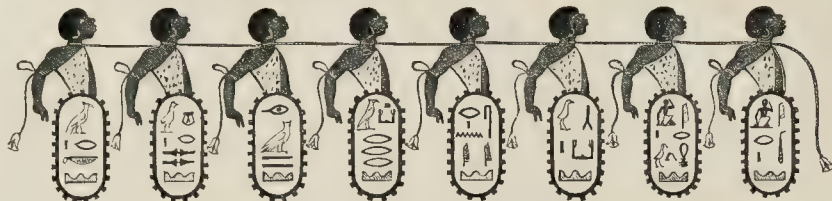
Another attractive object in the Egyptian Court is THE RAMSEION,* at Thebes. According to the learned Mr. Birch, this is a hybrid Greek form for the Egyptian El-En-Ramos, the abode of Ramses, or Ramses the Great, the second of that name, who is supposed to be the Sesostris of the Greeks. It has been called the Memnonium by some writers, and by Heataus, the tomb of Osymandyas. The French savans, who accompanied the army to Egypt under Buonaparte, call the temple that stands between Medinet Aboo and El-Ebek, the Memnonium; and as the identity of this famous monument, and still more famous statue called Memnon, has been much disputed, we shall here collect the learning on the subject.

Pausanias gives the following account:—"The colossus of the

* See Engraving, p. 20.

* See Engraving, p. 21.

Egyptians, which is in Egyptian Thebes, on the other side of the Nile, is a sitting vocal statue; the vulgar call it Memnon, whom they relate to have emigrated from Ethiopia into Egypt, and as far as Susa. But the Thebans say that it is not Memnon, but the statue of Phamenoph their countryman. Some assured me that it was the statue of Sesostris, which was hewn in twain by Cambyases; and the upper part from the head to the waist has been thrown down. The remainder is seated, and utters a sound every day at sunrise, like that of the bursting of the string of a harp or lyre."



AFRICAN PRISONERS CONQUERED BY RAMESES.

Strabo says, "There were two colossal statues, each of one stone, and near each other, on the opposite side of the river where was the Memnonium; of one of these the upper part was broken off, and said to have been caused by an earthquake; and that from the part which remained on the throne, or base, a sound issued every day, resembling that of a slight blow." This exactly accords with the verse in Juvenal,—

"Dimidio magis resonant ubi Memnone chordæ."

Mr. Hamilton states that, "The two statues in question are but fifty-four feet asunder; they face the same point of the compass; they are very similar in size, character, and proportions; one of them, that to the south, is certainly of a single block of stone, and the northernmost has been evidently broken off at the waist; and while the lower part is a monolith, the body, arms, and head are constructed of several horizontal layers of stones, apparently of a different kind from the legs and arms." He quotes Tzetzes, who says it was of a mixed red or spotted stone; which Mr. Hamilton confirms from his personal observations, saying, that in some places it is quite red, in others resembling the *breccia*, or pudding-stone, with pebbles of various colours.

The statue of Memnon is broken off at the waist. The face is entirely obliterated. The fall carried away the whole of the wall of the temple which stood within its reach. The two other colossal statues, called the Memnon by some writers, are in the plain about half-way between the desert and the river. Denon, and other French writers, consider the fallen colossus at the temple they call the Memnonium, the statue of Memnon. Bishop Pococke considers the true Memnon to be the northernmost one of the two last mentioned, in which judgment Mr. Hamilton concurs. The proportions of the colossus are these: the height of the leg and foot is eighteen feet five inches, the length of the little finger four feet five inches; it measures six feet ten inches over the foot, and sixty-two to sixty-three feet round the shoulders.

Belzoni gives the following account: "It (the Memnonium) stands elevated above the plain, which is annually inundated by the Nile. The water reaches quite to the propylæon; and, though this is considerably lower than the temple, I beg leave to observe that it may be considered one of the proofs that the bed of the Nile has risen considerably higher since the Memnonium was erected; for it is not to be supposed that the Egyptians built the propylæon, which is the entrance to the temple, so low as not to be able to enter it when the water was at its height. The groups of columns of that temple, and the views of the numerous tombs excavated in the high rock behind it, present a strange appearance to the eye. On my approaching these ruins, I was surprised at the sight of the great colossus of Memnon, or Sesostris, or Osymandyas, or Phamenoph, or perhaps some other King of Egypt; for such are the various opinions of its origin, and so many names have been given to it, that at last it has no name at all. I can but say that it must have been one of the most venerated statues of the Egyptians; for

it must have required more labour to convey such a mass of granite from Assouan to Thebes, than to transport the obelisk, commonly known under the appellation of Pompey's Pillar, to Alexandria."

Between these conflicting statements we have not the presumption to decide whether this monument should be called the Ramseion or the Memnonium. On entering the outer court, as represented at the Crystal Palace, the wall to the left is copied from a remarkable scene taken from the temple of Medinet Aboo. The king Rameses

there appears in all the pomp of a conqueror, and the token of his victory is displayed in the amputated hands of the slain, counted by a scribe or registrar. There are rows of prisoners, bound together with a cord round their necks, very much in the style of the sculptures of Darius at Behistan. A battle is vividly depicted in this Court. Soldiers are seen scaling the walls of a fortified city. Rameses is conspicuous in the fight in his war-chariot, which crushes fallen warriors. These scenes closely resemble those of a similar character depicted in the Assyrian Court.

Another striking object is the GREAT HALL OF KARNAC, the side columns of which are reproduced in a style of surpassing magnificence. Pococke and Denon have given accurate plans of this temple, and the latter, in speaking of its wonderful and varied beauties, says, "One is fatigued with describing, one is wearied with reading, one is startled at the mere thought of such a conception; it is difficult to believe, even after having seen them, in the real existence of so many structures united on one and the same point, in their vast dimensions, and in the indomitable perseverance which their building required, and in the incalculable cost of so much sumptuousness."

Karnac is about a mile and a half lower down the river than Luxor, but they were originally connected by an avenue of gigantic sphinxes. These avenues were very wide, being proportionate to the immense dimensions of Thebes, when that city had a hundred gates, from each of which two hundred armed chariots issued to battle. These gates were from 100 to 400 feet in length, 80 in height, and 40 in width. Karnac, otherwise called Diospolis, was the grand Temple of Jupiter, as its name implies. There Osiris was represented with the horns of Jupiter Ammon. According to Mr. Hamilton, the temple has twelve principal entrances, each of which is composed of several propylæa and colossal gateways, besides other buildings attached to them. In front of the body of the temple was a great court, at the sides of which were two rows of colonnades of thirty columns, and through the middle of which were two rows of columns of fifty feet high, consisting first of a prodigious hall or portico, whose roof was sustained by 134 columns, some of which were thirty-six feet in circumference and others thirty-four; then four beautiful obelisks, marking the entrance to the adytum, near which the monarch is represented embraced by the arms of Isis. The adytum consisted of three apartments entirely of granite. The principal room, which was in the centre, was twenty feet long, sixteen wide, and thirteen high. Three blocks of granite formed the ceiling, which was painted with clusters of stars on a blue ground. Beyond this were other porticoes and galleries, continued to another propylæon at a distance of 2000 feet from that of the western extremity of the temple. Diodorus says that this temple was thirteen stadii in circumference, and forty-five cubits high; while the walls were twenty-four feet thick, and he adds that the ornaments which embellished it corresponded to that extent. Eight stadii equal a mile; the cubit was about one foot and a half. This is the building which Diodorus describes as the most wonderful

and the most ancient of the four temples at Thebes, remarkable for their size and beauty.

The TEMPLE OF LUXOR, connected with that of Karnac by an avenue of sphinxes, as already observed, very nearly marks the southern extremity of the walls of Thebes on the eastern bank of the river. It has been called a palace, a temple, and a tomb. In approaching this temple from the north, following the description of Mr. Hamilton, the first object is a magnificent propylon, or gateway, which is 200 feet in length, and the top of it fifty-seven feet above the present level of the soil. In front of the entrance are the two most perfect obelisks in the world, each of a single block of red granite from the quarries of Elephantine. They are between seven and eight feet square at the base, and above eighty feet high; many of the hieroglyphic figures with which they are covered are an inch and three quarters deep, cut with the greatest nicety and precision. Between these obelisks and the propylon are two colossal statues also of red granite; from the difference of the dresses it is presumed that the one was a male, the other a female figure; they were nearly of equal size; though buried in the ground to the chest, they still measure twenty-one and twenty feet from thence to the top of the mitres. The attention of the traveller is soon drawn from these masses to the sculptures which cover the eastern wing of the north part of the propylon, on which is a very animated description of a remarkable

might have done credit to the genius of a Michael Angelo or of a Julio Romano."

In speaking of these stupendous monuments of Thebes, Belzoni states that "it is impossible to imagine the scene displayed without seeing it." As he stood on these ancient sites, "it appeared to me," he observes, "like entering a city of giants, who, after a long conflict, were all destroyed, leaving the ruins of their various temples as the only proofs of their former existence." The impression produced on his mind by contemplating Karnac is thus eloquently portrayed: "How can I describe my sensations at that moment! I seemed alone in the midst of all that is most sacred in the world; a forest of enormous columns, covered all round with beautiful figures and various ornaments, from the top to the bottom; the graceful shape of the lotus, which forms their capitals, and is so well proportioned to the columns that it gives to the view the most pleasing effect; the gates, the walls, the pedestals, and the architraves, also adorned in every part with symbolical figures in basso-relievo and intaglio, representing battles, processions, triumphs, feasts, offerings, and sacrifices, all relating no doubt to the ancient history of the country; the sanctuary, wholly formed of fine red granite, with the various obelisks standing before it, proclaiming to the distant passenger, 'Here is the Seat of Holiness.' The high portals seen at a distance from the openings to this vast



ISLE OF PHILÆ.

event in the campaigns of some Osymandyas or Sesostris. The disposition of the figures and the execution of the whole picture are equally admirable, and far surpass all ideas that have been formed of the state of the arts in Egypt at the era to which they have been attributed. The moment chosen for the representation of the battle is that when the troops of the enemy are driven back upon their fortress, and the Egyptians, in the full career of their victory, will soon be masters of the citadel.

Mr. Hamilton then minutely describes the battle scene, but at too great length to be transferred to our pages, and to abridge it would be mutilation. It is sufficient here to say that life and spirit pervade every part. Of the horses he speaks in terms of unqualified praise, whether they are rushing to the charge, fresh and uninjured, or fainting from loss of blood, or rearing and plunging in excess of torture. The fury of the conquerors is depicted in their countenances. The vanquished pray for mercy on their knees; others in the flight cast behind a look of anxious entreaty; their limbs, their hands, their eyes, sufficiently declare their fears. In concluding his description of this animated scene, Mr. Hamilton observes, "I here saw the original of many of Homer's battles, the portrait of some of the historical narratives of Herodotus, and one of the principal groundworks of the descriptions of Diodorus; but, to complete the gratification, we felt that had the artist been better acquainted with the rules and use of perspective, the performance

labyrinth of edifices, the various groups of ruins of the other temples within sight, these altogether had such an effect upon my soul as to separate me in imagination from the rest of mortals, exalt me on high over all, and cause me to forget entirely the trifles and follies of life."

The TEMPLE OF TENTURA is the first Egyptian temple the traveller sees on ascending the Nile. It was dedicated to Isis, and is unsurpassed in the beauty of its architecture, sculpture, and paintings. Denon considered it the sanctuary of the arts and sciences of Europe. The front face of the goddess appears on each side of the square capitals. Various figures are sculptured on the portico, interspersed with vases, lotus flowers, little boats, and sphinxes. Portions of this temple appear to have been devoted to sacrifice, as men are seen stamping on men, the bodies of others are represented as at the point of death, some are stretched on a bier, others are embalmed. Here also is seen the young Harpocrates, son of Osiris and Isis, seated on a full-blown lotus, one finger pressed against his lips, as representing the god of Silence. This temple is famous for the celebrated zodiac painted on the ceiling, enclosed by two long female figures, which extend along its whole length. This zodiac is copied in the great work of Denon, and has been elaborately commented upon by Visconti and De Lalande; the latter being of opinion, from the double appearance of the sign Cancer, that this zodiac was composed at the time when the summer

solstice was in the middle of that sign, which he states to have taken place 1200 years before the Christian era. Belzoni, however, ascribes this temple to the first Ptolemy, observing "that it is not improbable that he who laid the foundation of the Alexandrian Library instituted the philosophical society of the Museum, and studied to render himself beloved by the people, might erect such an edifice to convince the Egyptians of his superiority of mind over the ancient kings of Egypt, even in religious devotion." This hypothesis has, however, little weight when the character of the zodiac is considered.

The priests of Egypt were well versed in astronomy, and perfectly understood the precession of the equinoxes. They knew that the effect of that precession was to displace one entire sign of the zodiac in a period of 2160 years. They also constructed what is termed the Sothiac Period, which they fixed in the year 1322 before our era, which is said to have taken place in the reign of Menophres, who lived about the beginning of the nineteenth dynasty. The religious year of Egypt, called Sothiac, from Sothis or Sirius, whose heliacal rising indicated the arrival of the sun in Leo, was dated from the summer solstice. At the time this was established, the Egyptians counted exactly 365 days in the year, without any intercalation; consequently, at the end of every four years, there was one entire day short to make up four complete revolutions of the sun. At the end of 120 years there was a deficiency of one entire month; that is to say, the sun had not performed 120 complete revolutions by a deficit of thirty days. The commencement of the one hundred and twenty-first year, therefore, could no longer correspond with the summer solstice. Since then in a period of 120 years the beginning of the religious year was thrown back one entire month, in twelve times that period it must have been thrown back one entire year; in other words, the sun would only have made 1459 revolutions, though the Egyptians calculated as though he had made 1460 revolutions. Consequently, it was not before the expiration of 1461 years of 365 days in duration that the sun had exactly accomplished 1460 complete revolutions. It is easy to see that the omission of the quarters of the day caused this difference. Now this grand period of 1461 years, each of 365 days, which brought back the commencement of the sacred year to the solstitial point, marked by the heliacal rising of Sirius or Sothis, was called by the Egyptians the Sothiac Period. From the date of this period the ancient Sabeists fixed the commencement of their sacred year, the beginning of all created things, and the natal hour of the world, over the birth of which Sirius was supposed to have presided.

All the eastern nations framed what are called "periods of restitution," to which the philosophers have referred. None of those can be called the "grand year" unless it be that which establishes in every possible respect the position of every one of the celestial bodies in the very same points from which they are assumed to have started;* for these periods of restitution necessarily imply a beginning, at which the solar, planetary, and sidereal revolution commenced, and the time consumed in bringing back all the planets and stars to that assumed initial point, constituted the great year. Now as the precession of the equinoxes on the one hand, and the varied movement of each of the planets, on the other hand, change at every instant the position of the heavens relatively to the earth, there can be no great period of restitution but that which harmonizes all these movements, and causes their termination to coincide once or oftener with the assumed point of departure. The ancients fixed the great revolution of the heavens at 36,000 years, allowing one degree for each 100 years of movement, and they called it the "period of the eight movements," or of the "precession," because the equinoctial colure was then brought back to Aries. Therefore, every great year, whether more or less than 36,000 years, without being a multiple of it, could not be the grand period of restitution; for the restitution of the celestial appearances must, by the hypothesis, be complete, and a variation in any single one would be fatal to the unity and entirety of the system. The Chaldaic period, preserved by Berosus, exactly answers the conditions of the problem, and it is the only one transmitted by ancient writers that does so. The duration of the Chaldaic period is 432,000, which is a multiple of 36,000 years, containing it twelve times

* "Est præterea annus quem Aristoteles maximum, potius quam magnum, appellat, quem solis, lune, vacuumque quatuor stellarum orbis, conant, cum ad idem signum ubi quondam simul fuerunt, una reuertitur."

CENSORINE. *De Die Natiuitatis*, c. 15.

without a remainder. This is the great month of which Virgil speaks in his fourth eclogue, for it is really a twelfth part of the great year: "Incipient magni procedere menses."

At a very early period the Egyptian year was lunar, and its duration only 354 days. This primitive annual reckoning was measured by the course of the moon, and was composed of twelve lunar months of twenty-nine and a half days each, or of twelve months of twenty-nine and thirty days alternatively. On this basis, six months of twenty-nine days each, giving 174 days, and six months of thirty days each, giving 180 days, the sum would equal 354 days. It must have been soon observed that the sun did not complete his annual revolution so soon as the moon. It was at first supposed that the difference in time amounted to six days. By adding them to a lunar year, the ancient solar year contained exactly 360 days. The zodiac was then divided into 360 degrees, and the duodecimal division into signs established, the sun being presumed to traverse exactly one degree per day, one entire sign per month, and consequently the whole circle in 360 days. After a considerable time, the error of this calculation was discovered; for it was observed that, at the end of 360 days, the sun had not really travelled through the entire zodiac. It thus became necessary to lengthen the duration of the year, that it might correspond with the solar revolution, and accordingly five more days were added, making 365 days, the vulgar solar year. The Egyptians called these additional days by the names of Osiris, Aroueris, Typhon, Isis, and Nephthé.

Plutarch, in his treatise upon Osiris and Isis, has a curious mythological account of this extension of the year. He states that a secret connection between Rhea and Saturn being discovered by the sun, who threatened that she should not be delivered of any child in any month or year, Mercury, who was also in love with Rhea, having won from the moon at play, with dice or counters, the twentieth part of each of her annual illuminations, composed the Epagomenes, or five superadded days, on each of which days the five great deities of Europe were successively born of Rhea. These were Osiris, Aroueris, also called Apollo or the elder Horus, Typhon, Isis, and Nephthé. To this last was also given the names of Teleuté, Aphrodité, and Niké. Plutarch further says that the sun was the father of Osiris and Aroueris, Mercury of Isis, and Saturn of Typhon and Nephthé.

The zodiac of Tentyra and the remarks of De Lalande have led us into these astronomical topics, nor are they irrelevant to our mode of treating the subject, for astronomy is the true key to the monuments of Egypt. Their gods took their attributes from the seasons, and their mythology, however disguised, may be detected in Persia, Greece, and Rome. Thus, when the Persians commenced their year at the vernal equinox, Mithra, their chief divinity, was represented riding on a bull, the symbol of the zodiacal sign of spring at an early period; but when the precession had brought forward Aries to the solstitial colure, then Mithra assumed the attributes of the Ram. The worship of the sun was universal throughout the East. He is the Adonis of Phœnicia, the Osiris of Egypt, the Mithra of the Persians, the Atys of Lydia, the Bacchus of the Arabians, the Ammon of Lybia, the Belus of Chaldaea, the Apollo of the Greeks and Romans. The moon received a worship as extensive as the sun. She is Isis, Diana, Trivia, Passinuntia, Hecate. The conflicting dominion of light and darkness was shared equally by the sun and moon, and when he became the Jupiter Autumnalis, she became the Juno Infernalis; when he became Pluto, she became Proserpine. It is in this sense that we are to understand the reply of the oracle at Claros, over which Apollo presided, when he answered the interrogatory as to his nature in these words: "I am Jupiter Ammon in spring, and the Black Pluto in winter."

THE SERAPION AND POMPEY'S PILLAR.—This temple and column are not illustrated in the Crystal Palace, but as they are among the most famous of the antiquities of Egypt, some account of them falls within our plan. The celebrated pillar associated with the name of the great rival of Julius Cæsar has led to much controversy, and it is now certain that it has no reference to Pompey. It is true that that illustrious Roman restored Ptolemy Auletes to the throne of Egypt, and that the son of Ptolemy Auletes murdered the friend and benefactor of his family. It is also true that Cæsar wept at the sad termination of the career of his competitor, but there is not a shadow of evidence to prove that any of these three personages erected a monument to Pompey. Mr. Edward Wortley Mon-

tague published a statement in the *Philosophical Transactions*, vol. lvii., p. 438, in which he attributed the building of the column to Vespasian, because he found at its base a medal of that emperor; but it was well known at Alexandria that he was hoaxed, the medal having been deposited merely for the purpose of deluding the credulous traveller. Père Sicard, a French missionary, who died of the plague in Egypt, suspected that this column was erected by Ptolemy Evergetes, but assigns no reason for his conjecture; which was, however, adopted by Brotier, the learned editor of Tacitus. Sicard says, that with the exception of eight or ten unconnected letters, the inscriptions were obliterated. M. De Maillet, appointed French Consul-General in Egypt in 1692, notices the pillar, but says that he could not decipher the Greek writing upon it on account of the varied colour of the marbles. The Danish traveller Norden examined it in 1738, and says, "I will only remark that as this colossus is of the Corinthian order, its erection seems due to the age of the Ptolemies." In 1761 Niebuhr visited it, and observes that "it appeared not to be the intention of the Greek architect to immortalize his name by inscribing it on the column, or that he did not know the art of carving upon stone so well as the Egyptians did; for had the Greeks cut as deeply as the Egyptians did on their obelisks, the inscription would not now be illegible." The learned Michaelis calls the column after the name of the Emperor Severus, on the authority of Abulfeda's *Geography of Egypt*.

These several opinions have been critically examined by Dr. White, Professor of Arabic in the University of Oxford, at the close of the last century, and by him refuted. The Arabic expression "Amûd Issawârî," by which Pompey's Pillar was distinguished in the middle-ages, is translated by Dr. White, "The Column of the Pillars," and he declares that it has no other signification.* This erudite scholar observes that to an English ear this phrase will appear rather tautologous. Our language affords no correspondent term, no word equally extensive and comprehensive with "Amûd," which includes both the round and the square pillar, and may be applied to a Grecian column or a square obelisk. At the time when the Arabic language first prevailed in Egypt, there were only two extraordinary objects of this kind remaining at Alexandria,—Cleopatra's Needle and Pompey's Pillar; and the inhabitants appear to have distinguished them by their local situation, calling the one "Amûd el Bahri," "The Column of the Sea;" and the other "Amûd Issawârî," "The Column of the Pillars." The ruins of Persepolis are to this day called, in the language of Persia, "Chehel Minar," "The Forty Pillars."

Dr. White then proceeds to notice the Alexandrian TEMPLE OF SERAPIS, of which Rufinus, who wrote about the end of the fourth century, has left a complete and most interesting description. Its extensive quadrangles, the spacious windows, the vast and magnificent style of the building, together with the gigantic statue of the deity, filled his mind with ideas of grandeur and immensity, which has induced some sceptical writers to charge him with exaggeration. But his accuracy is attested by Ammianus Marcellinus, who declares that after the Capitol of Rome, the world possessed no building comparable to the Serapium. The image for the reception of which this superb temple was raised, was introduced into Egypt from the Euxine Sea by the first Ptolemy. Tacitus has minutely recorded the history of this event, stating that the removal of the statue to Alexandria was accompanied with miraculous circumstances; and that a temple suitable to the dignity of the city was erected in the suburb called Rhacotis, where a chapel dedicated to Serapis and Isis had formerly stood. From various circumstances it may be inferred that Ptolemy Soter designed and commenced the Serapium, which Ptolemy Philadelphus completed in the following reign.

The Arabic writers affirm that the column, popularly called Pompey's Pillar, stood at the northern angle of a great building of uncertain antiquity, and that 400 of the pillars of that building were standing round it, and with which it was thus connected; hence it received its popular name of Amûd Issawârî, or the "Column of the Pillars." Here also was the famous library which Amrou destroyed by the command of the Caliph Omar; and Dr. White has shown that this library formed part of the Serapium. Whence it is fairly to be inferred that the column stood within its precincts.

Pliny distinctly states that Ptolemy Philadelphus raised an obelisk of eighty cubits, as a pledge of his affectionate regard to the memory of his wife, Arsinoë. This monarch was also celebrated for his piety towards his parents, and as he wished to display to his Egyptian subjects the architecture of his own country in its utmost magnificence, he constructed the column, not in honour of Pompey, but in honour of his father, who was the founder of the Ptolemæan dynasty, and who built the Temple of Serapis, in front of which his son placed the column, surmounted by his father's statue; hence it was called the "Column of the Pillars." Such is the theory of the ingenious and learned Dr. White, and they who desire to see at length the mass of varied erudition by which he maintains his hypothesis, are referred to his instructive volume already quoted.

The general reader cannot fail to be gratified by our placing before him the vivid description which Gibbon has given of the Serapium. "In this wide and varied prospect of devastation, the spectator may distinguish the ruins of the Temple of Serapis at Alexandria. Serapis does not appear to have been one of the native gods, or monsters, who sprang from the fruitful soil of superstitious Egypt. The first of the Ptolemies had been commanded, by a dream, to import the mysterious stranger from the coast of Pontus, where he had been long adored by the inhabitants of Sinope; but his attributes and his reign were so imperfectly understood, that it became a subject of dispute whether he represented the bright orb of day, or the gloomy monarch of the subterranean regions. The Egyptians, who were obstinately devoted to the religion of their fathers, refused to admit this foreign deity within the walls of their cities. But the obsequious priests, who were seduced by the liberality of the Ptolemies, submitted without resistance to the power of the king of Pontus; an honourable and domestic genealogy was provided; and this fortunate usurper was introduced into the throne and bed of Osiris, the husband of Isis, and the celestial monarch of Egypt. Alexandria, which claimed his peculiar protection, gloried in the name of the city of Serapis. His temple, which rivalled the pride and magnificence of the Capitol, was erected on the spacious summit of an artificial mount, raised one hundred steps above the level of the adjacent parts of the city, and the interior cavity was strongly supported by arches, and distributed into vaults and subterranean apartments. The consecrated buildings were surrounded by a quadrangular portico; the stately halls, the exquisite statues, displayed the triumph of the arts; and the treasures of ancient learning were preserved in the famous Alexandrian Library, which had arisen with new splendour from its ashes. After the edicts of Theodosius had severely prohibited the sacrifices of the pagans, they were still tolerated in the city and Temple of Serapis; and this singular indulgence was imprudently ascribed to the superstitious terrors of the Christians themselves; as if they had feared to abolish those ancient rites, which could alone secure the inundations of the Nile, the harvest of Egypt, and the subsistence of Constantinople."

This superb temple was destroyed by the iconoclastic zeal of Theophilus, who filled the archiepiscopal throne of Alexandria, the votaries of Serapis offering a bold resistance, although in a decided minority. The archbishop pointed out to his flock the frauds of the priests in the use they made of the loadstone, and their secret contrivances for introducing a living actor into the hollow statue. "An intrepid soldier," says Gibbon, "animated by zeal, and armed with a weighty battleaxe, ascended the ladder; and even the Christian multitude expected, with some anxiety, the event of the combat. He aimed a vigorous stroke against the cheek of Serapis; the cheek fell to the ground; the thunder was still silent, and both the heavens and the earth continued to preserve their accustomed order and tranquillity. The victorious soldier repeated his blows; the huge idol was overthrown, and broken in pieces; and the limbs of Serapis were ignominiously dragged through the streets of Alexandria; his mangled corpse was burnt in the amphitheatre, amidst the shouts of the populace; and many persons attributed their conversion to this discovery of the impotence of their tutelary deity."

Another beautiful monument represented in the Crystal Palace is the PORTICO OF THE TEMPLE OF ISIS, in the island of Philæ. This island is about 1000 feet in its greatest length, while its greatest breadth is 400. It was here that the Egyptians collected all that was most picturesque and beautiful in their architecture. Here was displayed, in the most attractive forms, the finest

* *Egyptiaca*, part i., p. 31. Edit. 1801.

imitations of the palm-branch and the lotus. The sculptured ceilings, columns, and walls, were painted in the most vivid colours. It was in temples of this description that the Egyptian priests lavished their treasures, and that the Jews first learned to make the likeness of every thing that was in heaven and on earth, or in the waters under the earth; that they learned to bow down and worship their gods of silver and their gods of gold. It was this worship that made all the people, at the command of Aaron, tear the earrings from their wives, their sons, and their daughters, with which he was to make the golden calf. PHILÆ* was held in peculiar veneration, it being a popular belief that it was the burial-place of Osiris; but this honour was contended for by Abydos, Memphis, Busiris, and Teph Osiris. Belzoni refers the Isiac temple at Philæ to the time of the Ptolemies, and the style of the hieroglyphics satisfied him that it belongs to the last era of the Egyptian nation. The style of the columns is much lighter than in the more ancient monuments of Egypt; some of the inner apartments have served as places of worship both to Greeks and Romans. On the keystones of the middle arch Belzoni saw the word "sanctum" thrice repeated, and there are other palpable marks of the whole temple having been fitted up for

artists produced the most vivid and animated representations, quite justifying the glowing descriptions we have quoted from Mr. Hamilton, and of which we furnish a specimen in the military career of Rameses the Great.

The influence of Egypt on civilization has been extensive and permanent; and if we desire to trace backwards the progress of the human mind, we must specially study its antiquities and institutions. Egypt taught the early sages of Greece, and there Pythagoras learned the true physical system of the heavens, so long misunderstood from his death till the age of Copernicus and Newton. To this Virgil expressly alludes:—

"Vidit et ætherio mundum torquerier axa,
Et septem æternis sonitum dare Vocibus aures."

We of course smile at "the music of the spheres," and the divine harmony produced by the movement of the planets, inaudible to human ears on account of the distance; but it is certain that Pythagoras knew that the planets revolved round the sun. The knowledge imparted by Egypt enlightened early Greece, and was transmitted to Rome. All the mythology of those countries may be traced to the same source. Modern Europe still places its



RAMESSES II. BESIEGING A CASTLE. B.C. 1170.

Christian devotion. The whole island is covered with ruins, which Belzoni considers the most superb he ever beheld grouped together on so small a space of ground.

The religion of Egypt, so long as it was maintained in its purity, prevented improvement in sculpture; for it was not permitted to introduce any material innovations in the treatment of the human figure, and indeed all subjects relating to religion retained the primitive conventional style. "A god in the latest temple," says Sir Gardner Wilkinson, "was of the same form as when represented on monuments of the earliest date; and king Menes would have recognised Amun or Osiris in a Ptolemaic or Roman sanctuary." Egyptian bass-relief appears to have been in its origin a mere copy of painting, its predecessor. The first attempt to represent the figures of gods, sacred emblems, or other subjects, consisted in drawing or painting simple outlines of them on a flat surface, the details being afterwards put in with colour. They were afterwards traced on stone with a tool, and the intermediate space between the figures being then cut away, the once level surface assumed the appearance of a bass-relief. Such was the character of all bass-reliefs on Egyptian monuments. In battle scenes, however, the Egyptian

obelisks in its capital cities. The connection between Etruria and Egypt is certain, and the artisans of the former country constructed the primitive monuments of Rome. The learned authoress, Mrs Gray, in her instructive volume, *A Tour to the Sepulchres of Etruria*, says, "In the Egyptian Museum of Florence we saw a small china vase, which we thought had just been removed from a drawing-room chimney-piece, but which Professor Rossellini assured us he had himself taken from one of the tombs of the ancient Pharaohs, which bore all the marks of never having been previously opened. On one side there is a blue flower, and on the other a Chinese character, which was thus translated by Mr. Davis, the distinguished Chinese scholar, 'The flower opens, and to a new year;' and was pronounced to be in no way different from the modern writing of the celestial empire. In the same museum I saw a Scythian war-chariot, which had been taken by Rossellini from the Egyptian tomb of one who was probably a bold captain in the army of Rameses the Great, and who had brought it home as a trophy of distant Asiatic victory. Among our Etruscan scarabei there is one of large size and great beauty from China, formed of rock of emerald, and of which the intaglio is a grove of lotus, wherein stand the divinities Isis and Horus, represented in the best Egyptian style, and we narrowly missed acquiring another, which was of still more uncommon value,

* See Engraving, p. 25.

as on it, by the side of a female warrior destroying a prostrate foe, there was a royal cartouche filled with hieroglyphics. I mention these precious gems as a strong link of evidence connecting Egypt with Etruria, for there can be no doubt, from the shape, that the stones are Etruscan, while the intaglios are as assuredly Egyptian."

In 1817 the Signor Carnevali, a gentleman of Albano, discovered several sepulchral urns and cinerary vases, when turning up some of his land to form a plantation. This led to a minute investigation by the Italian antiquaries, and a Report was drawn up by Alexander Visconti. It is known that at some remote though undated period, but presumed to be prior to the foundation of Alba Longa by Ascanius, the son of Æneas, the Alban Mount, being volcanic, was thrown down, and a lake formed on its site. Antiquaries have fixed this convulsion of nature in the year 1176 before the Christian era. Mr. Hobhouse, now Lord Broughton, in alluding to the discovery of Signor Carnevali, makes the following remarks:—

"It is premised that the peperine under which the Tomasetti Vase, and (by induction) all the vases were laid, was originally a volcanic substance thrown up at the great convulsion, and gradually formed into stone. These burials then did not take place after, but before the present surface was formed; therefore they belong to a people who lived in Alba before the lake was formed and the crater was extinct; these people Visconti calls aborigines. With this foundation the Roman antiquary endeavours to show that the burials may have belonged to a people even of the extreme antiquity requisite for such a supposition."*

Among these exhumed remains was a little balsamic vase called "Leeytus;" vessels called "Animatoria," with funnels for the exhalation of perfumed smoke; a vase called "Calefactorium;" a buckle used to fasten the cloth which enclosed the ashes of the dead; a vase for lustral water; four vases supposed to hold wine, oil, milk, &c.; a vase with a spout, three dishes, and a bowl with two handles, a lamp, the oscilla, or little clay figure, and a writing stylus, with the obliterating instrument attached.

It is evident that these utensils and implements must have been made by a race of people very much more advanced in civilization than the rude subjects of King Evander, who is supposed to have settled on the Palatine Hill sixty years before the Trojan war, and who is said to have introduced the letters, music, manners, and

some of the arts of Greece. According to the Roman writers, the early Greek inhabitants of Latium came from Achaia, and were afterwards joined by colonists from Argos; but it cannot with any degree of fairness be contended that they fashioned the gems and vases which bear evidence of Egyptian manufacture, as shown by Mrs. Gray, who wrote many years after Mr. Hobhouse, when much more extensive discoveries had been made than when he published his volume in 1818. He mentions a theory suggested to him by an English antiquary, who presumes that the figures which Visconti thought might be letters or whole words, betray a Runic or Scandinavian origin, being cruciform in shape, and resembling the hammer of Thor. Mr. Hobhouse refers to some medals and amulets contained in the Museum of the Royal Academy of Copenhagen, and observes that "the similarity between these Runic hammer-crosses and the marks on the vases at Alba Longa is so great that one might be tempted to maintain their identity;" but, he adds, there is perhaps some connection between both and the *crux ansata* of the Egyptian monuments. In the present state of our knowledge of Etrurian antiquities, there can be no doubt that its inhabitants had a very intimate intercourse with the land of Osiris and Isis.

Thus the land of the Pharaohs, from a very early period, is intimately connected with ancient Italy, and probably poured into its primitive wilderness its civilization and its arts, and Etruria gave its religion and its science to the city of Romulus. At a later date Egypt received her kings from the descendants of one of the successful generals of Alexander, and became the pupil after having been the teacher of Greece. Then she fell under the dominion of Rome, and the capital of the Cæsars was ornamented with her antique monuments. Modern cities are proud at being embellished with her obelisks, which many consider to be older even than her pyramids. By such structures the remote past is connected with the present; and could the cotemporaries of Cheops or Rameses rise from their graves, they would behold in a land of which they had never heard, and within the walls of a temple composed of the most brittle materials, a faithful representation of their habits and customs, of their gigantic monuments, of their curious devices, of their ruder ignorance, and of their cultured intelligence. In these pictorial and artistic reproductions of the days of old, we may study the vicissitudes of empires and the instability of greatness, and, warned by experience, cultivate that virtue which imparts strength, and practise that piety which ensures protection.

* Illustrations of the Fourth Canto of *Chil's Harold*. By John Cam Hobhouse.



THE ALHAMBRA COURT.

BEFORE approaching the epoch of those Arabian Moors, or Saracens, who overthrew the Gothic empire established in Spain, founded the kingdom of Cordova, and built the gorgeous palace of Alhambra, we propose, in a rapid retrospect, to sketch the state of the Iberian peninsula from the earliest period of its history to the era of the Mahometan conquest.

SPAIN UNDER THE CARTHAGINIANS AND ROMANS.

Spain occupies the most western portion of southern Europe; encircled by the Atlantic Ocean and the Mediterranean Sea, it forms with Portugal a peninsula whose circumference is nearly 630 leagues. This beautiful region received different names from the historians of antiquity. The Greeks called the portion with which they were acquainted Iberia; the Latins knew it as Hesperia. The name of Spain appears to have been of Carthaginian origin. The Pyrenean mountains, the Atlantic, and the Mediterranean, have ever formed its natural limits. Augustus divided it into three provinces—Lusitania, Bœtica, and Tarraconensis. "The kingdom of Portugal," as Gibbon has remarked, "now fills the place of the warlike country of the Lusitanians; and the loss sustained by the former on the side of the east, is compensated by an accession of territory towards the north.

The empires of Granada and Andalusia correspond with those of Bœtica. The remainder of Spain—Galicia and the Asturias, Biscay and Navarre, Leon and the two Castiles, Murcia, Valentia, Catalonia and Aragon, all contributed to form the third and most considerable of the Roman governments, which, from the name of its capital, was styled the province of Tarragona. Of the native barbarians, the Celtiberians were the most powerful, as the Cantabrians and Asturians formed the most obstinate. Confident in the strength of their mountains, they were the last who submitted to the arms of Rome, and the first who threw off the yoke of the Arabs."

Among other cities, the Phœnicians founded Cadiz and Medina Sidonia, which name recalls that of Sidon, so famous for its commerce and wealth. Those pacific conquerors introduced their arts, their language, and their religion into Bœtica, and coasting the Mediterranean, landed in Granada, Murcia, and Valentia; they advanced to the Pyrenees; and worked the gold and silver mines which are said to have been so productive that the Phœnicians left behind them all their utensils of lead and iron, having replaced them with precious metal.

This prodigious success attracted the competition of the Greeks; and the Rhodians, Samians, and Phœnicians, in succession, founded colonies on the shores of the Mediterranean. Carthage, commercial and warlike, next extended her trade to the opulent peninsula; she began with building factories, religious temples followed, and the sacred edifices were soon converted into fortresses. About the year 287 before our era, Hamilcar Barca, the famous Carthaginian, founded Barcelona, and the name of that city still perpetuates his fame. His brother, Asdrubal, built Carthagena, and married a Spanish lady. It was under his instruction that Hannibal learnt the art of war, and as he went to the country when only nine years of age, he was almost considered a native.

The people of Greek origin, such as those of Saguntum and Ampurias, who inhabited the coasts of Catalonia and the kingdom of Valentia, alarmed at the rapid aggrandisement of their powerful neighbours, invoked and obtained the Roman alliance. The Punic

Wars then followed, and Carthage was destroyed by her more fortunate rival. During this contest occurred the memorable sieges of Saguntum and Numantia. Hannibal invested the former town, which, after a valorous resistance of eight months, yielded only to famine; and "Fames Saguntina" passed into a proverb. In the heroic defence the women rivalled the men in courage and fortitude, and when they saw their fathers, husbands, and sons, succumb under the last assault, they killed their children with their own hands, and rushed into the flames which consumed their unfortunate city.

On the downfall of Carthage Spain was ruled by Roman pretors, who enriched themselves by plundering the people. Insurrection broke out, and what is called the Lusitanian war commenced, about the year 160 before our era. The inhabitants were ruthlessly massacred by the Romans, and even those who threw away their weapons on the faith of a capitulation were mercilessly butchered. Then arose an avenger in the person of Viriatus, originally a shepherd, then a brigand, afterwards a soldier. He soon obtained a complete ascendancy, and inspired his followers with his undaunted spirit. The commencement of the Lusitanian war is variously narrated by different historians. According to some, after

the massacre perpetrated by Lucullus at Panza, Viriatus, already distinguished for his bravery and talents, assembled a body of his friends under the walls of that town, and standing in the midst of the ruins, while the vultures were pouncing down on the unburied dead, and the indignant mourners were recognising the remains of a father, a brother, or a friend, the Lusitanian hero caught sight of the corpse of one of his daughters, whose youth and sex had afforded no protection against the furies of a murdering soldiery. With tears in his eyes he raised the body of his child, and placing his hand upon her wounds, devoted her barbarous assassins to the infernal gods; and swore to avenge her in streams of Roman blood. Thousands of voices responded to his own, every sword was raised on high, and to complete this tragic ceremony a prisoner of equestrian rank was immolated on the spot. Viriatus and his principal comrades plunged their

hands into the quivering entrails of their victim, and repeated the terrible formula of condemnation.

In many battles the Roman legions were completely defeated, and the fame of Viriatus struck terror into the senate. Unable to conquer him in the field, the Romans put a price upon his head, corrupting three of his lieutenants, who stabbed him mortally while sleeping in his tent. During this war a part of Celtiberia had joined in the revolt, and Numantia, a city in alliance with the Romans, had afforded shelter to some Celtiberian fugitives. This act of humanity was construed into the crime of rebellion, and the city was besieged. The Numantians defeated several armies, though they were themselves only eight thousand strong; at length they were conquered by immensely superior forces, but scarcely one of the brave defenders survived to grace the triumph of the victor. Then Spain was subjugated, if we except the northern districts, where the poverty of the inhabitants and the almost inaccessible passes of the mountains secured their independence.

After an uninterrupted peace of about forty years, Sertorius, one of the most illustrious victims of the proscriptions which accompanied the civil war between Marius and Sylla, endeavoured to rouse once more the martial spirit and ancient pride of Spain,



TOWER OF COMARES.

and turn them to his own advantage. He exhorted the people to throw off the hateful yoke which the avarice of the Roman proconsuls had rendered insupportable. Two victories gave him the command of Spain, and he became a formidable rival to Rome. He established a government founded on the principles of the republic, to which the people readily assented, having been for so many years habituated to the customs of their conquerors. Sertorius established a senate, tribunes of the people, ædiles and questors; an army was disciplined. The inhabitants were contented with their institutions, and obeyed a ruler whom they believed to be inspired and protected by the gods. The *White Fawn* of Sertorius became famous in Spain. Rome was alarmed. The famous Pompey struggled in vain against the genius of the Spanish liberator; and the dagger which had murdered Viriatus was placed in the hands of Perpenna, one of the lieutenants of Sertorius, and that miscreant assassinated his chief. Perpenna formed a party of his own, and aspired to the supreme rule; but, beaten by Pompey, he was decapitated as the punishment of his double treachery.

When the triumvirate was formed between Crassus, Cæsar, and Pompey, the government of Spain fell to the lot of the conqueror of Perpenna; and when civil war broke out among these three ambitious tyrants, Afranius Varro and Petreius, lieutenants of Pompey, ruled in his name. They defeated Cæsar at the battle of Merida, but were afterwards compelled to surrender at discretion in the engagement fought between Lerida and Mequinenza. The victory of Pharsalia left Cæsar without a rival, but he was again called to Spain, where the sons of Pompey had raised a powerful army; but they were completely routed at the battle of Munda, a town then existing in the neighbourhood of the modern Malaga.

In the second triumvirate Lepidus obtained Spain. When Augustus became emperor, he imposed on the country a perpetual tribute, and introduced the territorial division of Tarraconensis, Lusitania, and Bætica, already mentioned. With that refinement of political hypocrisy for which he was famous, he pretended only to rule personally over the two first provinces, leaving the last, which was the most opulent, to the administration of a servile senate, who accepted the semblance of power as a boon, when the reality was in the hands of the usurper. Then were heard the last sighs of the old Spanish liberty, which were stifled by the legions of Agrippa.

This first epoch of Spanish history is glorious and heroic, for its people fought for freedom; and if it sunk beneath the sword of Rome, it must be recorded to its honour that it only fell before such men as the Scipios, Pompey, and Cæsar. The struggle lasted during two hundred years, and the result might have been doubtful had not one part of Spain turned its arms against the other. Internal division was its ruin. Sertorius said to them, "If you are united you will be invincible, but local pride prevents your union."

SPAIN UNDER THE GOTHs.

A long peace of about four hundred years succeeded the catastrophes we have described, during which Spain was happy and flourishing. The administration of Augustus was mild, and the grateful people raised monuments to his fame, and many cities added Augusta to their ancient name. Thus Saragossa, in earlier time called Salduba, received the new appellation of Cæsara Augusta; Merida was called Eborica Augusta; Braga, in Lusitania, the modern Portugal, took the same addition. Spain became wholly Roman in its feelings, arts, and habits; and in the enjoyment of tranquillity consoled itself for the loss of freedom. She considered herself rather the ally than the subject of Rome; and not without some show of reason, as the emperors Trajan, Hadrian, Marcus Aurelius, Maximus, and Theodosius, were born in Spain. She also had this inestimable advantage—the tribute due to the imperial treasury was fixed, and she was relieved from the arbitrary taxes formerly levied by the rapacity of the proconsuls.

In the year 123 of our era, the Emperor Hadrian, who was a great administrator, and saw the impolicy of centralisation, and of blending countries differing in climate and products to a universal rule of government, modified the territorial divisions introduced by Augustus. He separated Lusitania into three provinces—Galicia, Carthagera, and Mauritania. This last did not indeed belong to the peninsula, but to Africa; another was formed of the Balearic Isles. In revising Roman legislation in Spain, Hadrian made a special point to conserve intact all local usages, and thus con-

solidated his power, which any rude innovation would assuredly have weakened.

When Constantine transferred the seat of government to Byzantium, the forms of administration were changed throughout the whole of the Roman empire. The west was divided into two prefectures, of which one included Gaul, Britain, Spain, and the Balearic province. Spain was governed by consular legates, and by a vicar or lieutenant, under the authority of a prefect, who usually resided in Gaul. Industrious men quitted Italy and established themselves in the opulent peninsula, where they founded towns, many of which still exist; and the whole country is still covered with magnificent ruins, attesting the splendour of the monuments by which it was embellished under the rule of the emperors.

Under the feeble reigns of Arcadius and Honorius, sons of the first Theodosius, commenced the irruptions of the barbarians of the north, which prepared the fall of the old empire. At that period the Goths, the Vandals, the Suevi, and the Alani, invited by the ambitious rivalry of Stilicho and Rufinus, penetrated the frontier in all directions. If they came at the call of others, they remained to satiate their own cupidity, or promote their own policy. The greater part of Europe became the patrimony of these half-savage invaders. The formidable Alaric, king of the Goths, approached the walls of Rome, whose degenerate citizens, enervated by luxury, could offer no resistance to the fierce tribes of Germany and Seythia. "He condescended," says Gibbon, "to fix the ransom which he would accept as the price of his retreat from the walls of Rome—all the gold and silver in the city, whether it were the property of the state or of individuals, all the rich and precious moveables, and all the slaves who could prove their title to the name of *barbarians*. The ministers of the senate presumed to ask, in a modest and suppliant tone, 'If such, O king, are your demands, what do you intend to leave us?' 'Your lives!' replied the haughty conqueror. They trembled and retired."

Alaric received a powerful reinforcement of Goths and Huns, at the head of whom was Adolphus, the brother of his wife, who became his successor. He sacked Rome, and met a premature death after a short illness. His burial was so remarkable that we insert the account of it as described by Gibbon. "By the labour of a captive multitude they (the Goths) forcibly diverted the course of the Busentinus, a small river that washes the walls of Consentia. The royal sepulchre, adorned with the splendid spoils and trophies of Rome, was constructed in the vacant bed; the waters were then restored to their natural channel, and the sacred spot where the remains of Alaric had been deposited was for ever concealed by the inhuman massacre of the prisoners who had been employed to execute the work."

Adolphus married Placidia, daughter of the great Theodosius and sister of Honorius, and peace was thus restored between the Goths and Romans. While these events were passing, the mercenaries who guarded the Pyrenees invited the Suevi, the Vandals, and the Alani, to invade Spain.

"The irruption of these nations," says Mariana, "was followed by the most dreadful calamities, as the barbarians exercised their indiscriminate cruelty on the fortunes of the Romans and the Spaniards, and ravaged with equal fury the cities and the open country. The progress of famine reduced the miserable inhabitants to feed on the flesh of their fellow-creatures; and even the wild beasts, who multiplied without control in the desert, were exasperated by the taste of blood and the impatience of hunger boldly to attack and devour their human prey. Pestilence soon appeared—the inseparable companion of famine; a large proportion of the people was swept away, and the groans of the dying excited only the envy of their surviving friends. At length the barbarians, satiated with carnage and rapine, and afflicted by the contagious evils which they themselves had introduced, fixed their permanent seats in the depopulated country. The ancient Galicia, whose limits included the kingdom of old Castile, was divided between the Suevi and the Vandals, the Alani were scattered over the provinces of Carthagera and Lusitania, from the Mediterranean to the Atlantic Ocean; and the fruitful territory of Bætica was allotted to the Silingi, another branch of the Vandalic nation. After regulating this partition, the conquerors contracted with their new subjects some reciprocal engagements of protection and obedience; the lands were again cultivated, and the towns and villages were again occupied by a captive people. The greatest part of the Spaniards was even disposed to prefer this new condition of poverty and barbarism to

the severe oppression of the Roman government; yet there were many who still asserted their native freedom, and who refused, more especially in the mountains of Galicia, to submit to the barbarian yoke."

Adolphus undertook to expel these barbarians, crossed the Pyrenees, and entered Barcelona, in the palace of which city he was assassinated. The succession to the Gothic throne in the royal house of Balthi, from which Alaric sprung, was destroyed by the usurpation of Singeric, at whose death the free choice of the nation bestowed the sceptre on Wallia, who entered the service of the empire—and conquered the Suevi, Alani, and Vandals—as the ally of Honorius, emperor of the West. He died in the year 419, when the Vandals again entered Spain, massacred the Roman garrisons, and under their king, Gunderic, seized Carthage and Seville. Then it was that the beautiful country bordering the coast, and hitherto called Bætica, took the name of Vandalusia, afterwards corrupted into Andalusia.

Theodoric, a son of Alaric, succeeded Wallia, and allied himself with the Romans. He was slain in the great battle against Attila, whom history has styled the "Scourge of God," in the plains of Chalons, in Champagne, when the Goths elected his son Torismond their king, who was assassinated by his brothers. The history of those Gothic princes presents only a continued scene of cruelty and murder till we come to Euric, king of the Visigoths, who passed the Pyrenees at the head of a numerous army, seized the cities of Saragossa and Pampluna, the Tarraconese province, and permitted the Suevi to hold the kingdom of Galicia under the Gothic monarchy of Spain. Euric obtained possession of the whole peninsula in the year 471. He extended his conquests into Gaul, and died at Arles in 483. This king had murdered his brother to obtain the throne, but he ruled with wisdom and equity. He pacified Spain, and compiled into a code the scattered laws of the Goths, specially known in Aragon under the name of "Fuero

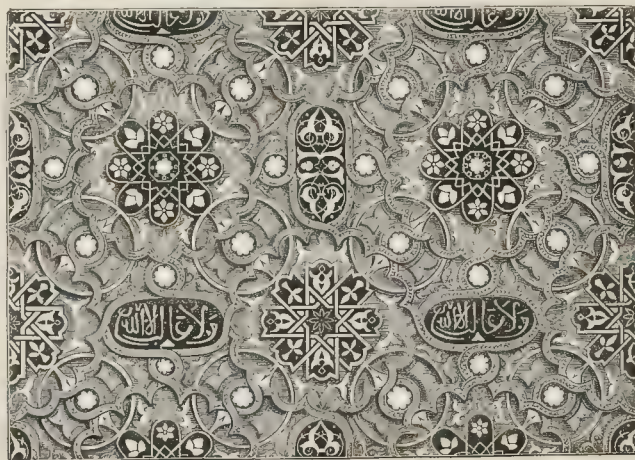
Jugo." Euric had received from Odoacer, who had extinguished the western empire, the sovereignty of all the Roman conquests

beyond the Alps, as far as the Rhine and the ocean; and Gibbon remarks that "France may ascribe her greatness to the premature death of the Gothic king at a time when his son Alaric was an helpless infant, and his adversary Clovis an ambitious and valiant youth." Clovis slew Alaric in personal combat, in a battle that took place about ten miles from Poitiers, when the Visigoths surrendered to him the greatest part of their Gallic possessions, but retained Spain. They were compelled to abandon their Arian heresy, and Recared became the first Catholic king. From his reign to that of Roderick, the last sovereign of the Gothic monarchy, the annals of the country are only remarkable for royal assassinations and foreign aggression, though it must be added that Sisebut, a Gothic king who reigned in the beginning of the seventh century, persecuted the Hebrews settled in the country with the most unrelenting cruelty.

"Ninety thousand Jews were compelled to receive the sacrament of baptism; the fortunes of the obstinate infidels were confiscated; their bodies were tortured, and it seems doubtful whether they were permitted to abandon their native country. The excessive zeal of the Catholic king was moderated even by the clergy of Spain, who solemnly pronounced an inconsistent sentence: that the sacrament should not be forcibly imposed, but that the Jews who had been baptized should be constrained, for the honour of the church, to persevere in the external practice of a religion which they disbelieved and detested. Their frequent relapses provoked one of the successors of Sisebut to banish the whole nation from his dominions; and a council of Toledo published a decree that every Gothic king should swear to maintain this salutary edict. But as the tyrants were unwilling to dismiss the victims whom they delighted to torture, or to deprive themselves of the industrious slaves over whom they



ENTRANCE TO THE COURT OF LIONS.



DIAPER ON THE WALLS.

might exercise a lucrative oppression, the Jews still continued in Spain, under the weight of the civil and ecclesiastical laws, which in the same country have been faithfully transcribed in the code of the Inquisition. The Gothic kings and bishops at length discovered that injuries will produce hatred, and that hatred will find the opportunity of revenge. A nation, the secret or professed enemies of Christianity, still multiplied in servitude and distress; and the intrigues of the Jews promoted the rapid success of the Arabian conquerors.*

SPAIN UNDER THE MOORS.

The beautiful peninsula which had passed under the rule of the Carthaginians, Romans, Goths and Visigoths, now received a new master from the descendants of Mahomet. The Arabian Moors, better known by the appellation of Saracens, who had pushed their conquests up to the Pillars of Hercules, had long coveted with greedy eyes the fertile fields of Spain. During the reign of the Gothic king Recessuinthus, who ascended the throne in the year 652 of our era, they had ravaged the coasts of Andalusia; and under his successor, Wamba, they equipped a maritime expe-

reinforcements, and his army amounted to seventeen thousand fighting men. Roderick awoke from the voluptuous lethargy in which he was indulging, and summoned the dukes and counts of the Gothic monarchy to repel the invaders. The royal forces amounted to nearly one hundred thousand men. A decisive battle was fought at Xeres de la Frontera, in the neighbourhood of Cadiz, in which the Moors achieved a complete victory. Roderick fled, and was drowned in attempting to cross the Guadalquivir. Count Julian then addressed the victorious Saracen in the following terms:—"The king of the Goths is slain, their princes are fled before you, the army is routed, the nation is astonished. Secure with sufficient detachments the cities of Bœtica, and without delay march to the royal city of Toledo, and allow not the distracted Christians either time or tranquillity for the election of a new monarch." (Gibbon.) Tarik followed this advice; and excepting the sterile districts of the Asturias, Cantabria, and Navarre, the whole country submitted to his arms.

Musa, who governed Africa for the Caliph Walid, envious of the fame of Tarik, crossed over to Spain, and subjugated those towns which had dared to rise against their conquerors. Leaving the



GENERAL VIEW OF THE ALHAMBRA.

dition on a large scale, evidently with the design of effecting a permanent conquest; but Wamba defeated them, and brought triumphantly into the ports of Spain two hundred and seventy Saracen vessels. In the reign of Roderick, the last of the Gothic kings, the invasion of the Moors was successful, owing to the traitorous co-operation of the native chiefs. Musa, the Saracen general, had been defeated by Count Julian in his attempt to capture Ceuta, but shortly afterwards he was invited by that nobleman to aid in the dethronement of Roderick. Historians have differed as to the cause of this disloyalty. The severe criticism of modern writers has rejected the story of the violation of Count Julian's daughter by Roderick, and found in the ambition of a subject, too powerful to submit to a feeble master, sufficient reason for his treachery. Others explain the event by referring to the pretensions of the sons of Witiza, and the influence of their uncle Oppas, archbishop of Toledo and Seville.

In the year 710, Musa dispatched Tarik with five thousand veterans, and that experienced soldier landed at Gibraltar, a corruption of *Gebel el Tarik*, so called after his name. He soon received

government of Spain to his son, Abdelaziz, he returned in triumph to Africa; but both he and Tarik experienced the ingratitude of the caliph. His son Abdelaziz was murdered in the mosque of the palace of Cordova, by the direct order of the caliph, on the ground that he had married Egilona, the widow of Roderick, and through her aspired to the honours of royalty. The head of Abdelaziz was presented to Musa, and the old warrior died of a broken heart at Mecca. Tarik was publicly flogged for a whole day in the sun before the palace gate of Damascus, but his life was spared, and he was allowed to mingle with the slaves.

Ayoub, the uncle and assassin of Abdelaziz, succeeded his nephew, and he was followed by Alahor, the first who led an army across the Pyrenees,—not so much from ambition as from prudence, for the restless rapacity of the Moors demanded a field for their avarice or their valour. The banners of Mahomet floated over that portion of Gaul which was known to the Romans as the first and second Narbonne. In a second expedition they lost a sanguinary battle under the walls of Toulouse, which they had seized and held since their first irruption. They again appeared under the viceroy Abderame, and pitched their camp not far from Tours, in the plains immortalized by their defeat. It was there that Charles

* Gibbon, chap. xxxvii.

Martel, or the Hammer, an illegitimate son of the elder Pepin, acquired his right to the throne of France by saving the French monarchy. Without his skill and valour France might have become a Mahometan country, and Spain for ever remained subject to the rule of the Crescent; for had the Saracens established themselves in the Visigothic dominions of Gaul, the Pyrenees would have become a fortress common to both divisions of the same people, and a protection to all who professed the religion of Islam. Referring to the triumph of Martel, Gibbon indulges in a still more disastrous speculation. "A victorious line of march," he says, "had been prolonged above a thousand miles—from the rock of Gibraltar to the banks of the Loire; the repetition of an equal space would have carried the Saracens to the confines of Poland and the highlands of Scotland; the Rhine is not more impassable than the Nile or Euphrates, and the Arabian fleet might have sailed without a naval combat into the mouth of the Thames. Perhaps the interpretation of the Koran would now be taught in the schools of Oxford, and her pulpits might demonstrate to a circumcised people the sanctity and truth of the revelation of Mahomet."

This desperate battle was doubtful in its issue during the first six days, but in the seventh Abderame was slain, and the Moslems retired to their camp; in the fury of their rage the various tribes turned their arms against each other, and completed their own disaster. The victory of the Franks was complete; the enemy never resumed the conquest of Gaul, though in a third irruption they seized the town of Arles, which they held for a short time; but eventually they were driven over the Pyrenees, which they never again crossed. Indeed, their policy underwent a complete change after this memorable defeat; for fearing that the enterprising spirit of the Franks would invade Spain, the second Abderame concluded a treaty of alliance with Pepin, king of France.

Ancient Spain, fashioned or curbed to submission under the successive yoke of the Romans and Goths, soon again lost what little remained of its antique character, and adopted the manners of its Moorish masters. Numerous tribes of the Arabian nation arrived to share in the fruits of the conquest, and their immigration renewed the native population, nearly exterminated by the ravages of war. The women who survived their husbands, and their daughters, were married to the conquerors; and the descendants of the mixed race were trained from the cradle in the doctrines of Mahomet. "A province is assimilated to the victorious state by the introduction of strangers, and the imitative spirit of the natives; and Spain, which had been successively tinctured with Punic, and Roman, and Gothic blood, imbibed, in a few generations, the name and manners of the Arabs. The first conquerors, and the twenty successive lieutenants of the caliphs, were attended by a numerous train of civil and military followers, who preferred a distant fortune to a narrow home; the private and public interest was promoted by the establishment of faithful colonies; and the cities of Spain were proud to commemorate the tribe or country of their eastern progenitors. The victorious though motley bands of Tarik and Musa asserted, by the name of *Spaniards*, their original claim of conquest; yet they allowed their brethren of Egypt to share their establishments of Murcia and Lisbon. The royal legion of Damascus was planted at Cordova; that of Emesa at Seville; that of Kinnisrin, or Chalcis, at Jaen; that of Palestine at Algezire and Medina Sidonia. The natives of Yemen and Persia were scattered around Toledo and the inland country; and the fertile seats of Granada were bestowed on ten thousand horsemen of Syria and Irak—the children of the purest and most noble of the Arabian tribes. A spirit of emulation, sometimes beneficial, more frequently dangerous, was nourished by these hereditary factions. Ten years after the conquest, a map of the province was presented to the caliph—the seas, the rivers, and the harbours, the inhabitants and cities, the climate, the soil, and the mineral productions of the earth. In the space of two centuries, the gifts of nature were improved by the agriculture, the manufactures, and the commerce of an industrious people; and the effects of their diligence have been magnified by the idleness of their fancy. The first of the Omniads who reigned in Spain solicited the support of the Christians; and, in his edict of peace and protection, he contents himself with a modest imposition of ten thousand ounces of gold, ten thousand pounds of silver, ten thousand horses, as many mules, one thousand cuirasses, with an equal number of helmets and lances. The most powerful of his successors derived from the same kingdom the annual tribute of twelve millions and forty-five

thousand dinars or pieces of gold—about six millions of sterling money; a sum which, in the tenth century, most probably surpassed the united revenues of the Christian monarchs. His royal seat of Cordova contained six hundred mosques, nine hundred baths, and two hundred thousand houses; he gave laws to eighty cities of the first, to three hundred of the second and third order; and the fertile banks of the Guadalquivir were adorned with twelve thousand villages and hamlets. The Arabs might exaggerate the truth, but they created and they describe the most prosperous era of the riches, the cultivation, and the populousness of Spain."

Whilst the secure possession of the beautiful peninsula had altered the simplicity or rudeness of primitive manners, and softened down the ferocity of the Moors, the rival ambitions of the Abassides and Omniads of the East kindled a flame whose flying sparks lighted up another conflagration on the banks of the Guadalquivir. A proscribed scion of the house of Omniads, escaping from the vengeance of his Asiatic enemies, reached Spain, and there found a party who pitied his sufferings, and were prepared to vindicate his pretensions to royalty. The white flag, which was the distinguishing banner of the Omniads, floated once more over the Mussulman cohorts, faithful to the posterity of Mahomet; and Abdehruman established the throne of Cordova, and was the father of the Omniads of Spain, who reigned above two hundred and fifty years from the Atlantic to the Pyrenees.

From this epoch may be dated the prosperity, grandeur, and magnificence of the Moorish sovereigns, the descriptions of which, without being exaggerated, appear to wear the character of oriental fable. The imaginative arts, and even the exact sciences, followed in the train of increasing wealth; and historians have traced the source of this prodigious opulence, which the treasures of no prince in Europe at that time approached, to the inexhaustible fertility of the Spanish soil, cultivated by the Moors with a skillfulness and industry beyond all praise. Without doubt, they were the ablest agriculturists in the world. Never, since their time, have the plains of the Guadalquivir been so fertile. In the palaces of the Moorish caliphs, who had made themselves independent of the caliphs of Damascus, gold and silver were lavished on ornaments of luxury, while the European princes could only aspire to decorations of the base metals. Twelve thousand knights, armed with scimitars having golden handles, and clothed in the most splendid pageantry of war, attended the caliph on all public processions. The most magnificent edifices arose at their several capitals—in Granada, Seville, Murcia, and Cordova, though their ruins now only remain. "Three miles from Cordova, in honour of his favourite sultana, the third and greatest of the Abdehrumans constructed the city, palace, and gardens of Zehra. Twenty-five years, and above three millions sterling, were employed by the founder: his liberal taste invited the artists of Constantinople, the most skillful sculptors and architects of the age; and the buildings were sustained or adorned by twelve hundred columns of Spanish and African, of Greek and Italian marble. The hall of audience was incrustated with gold and pearls, and a great basin in the centre was surrounded with the curious and costly figures of birds and quadrupeds. In a lofty pavilion of the gardens, one of these basins and fountains, so delightful in a sultry climate, was replenished, not with water, but with the purest quicksilver. The seraglio of Abdehruman, his wives, concubines, and black eunuchs, amounted to six thousand three hundred persons; and he was attended to the field by a guard of twelve thousand horse, whose belts and scimitars were studded with gold."†

This magnificent caliph left behind him an authentic memorial, found in his closet, which is a most instructive admonition to those who pursue the empty vanities of life:—"I have now reigned above fifty years in victory or peace; beloved by my subjects, dreaded by my enemies, and respected by my allies. Riches and honours, power and pleasure, have waited on my call, nor does any earthly blessing appear to have been wanting to my felicity. In this situation I have diligently numbered the days of pure and genuine happiness which have fallen to my lot—they amount to fourteen. O man! place not thy confidence in this present world!"‡

The splendour and riches of Moorish Spain only commenced with the independence of the caliphate of Cordova. While the Moorish viceroys were dependant on the viceroys of Africa, who in turn were dependant on the caliph of Damascus, Saracen Spain was a

* Gibbon, chap. II.

† Ibid., chap. III.

‡ Ibid.

scene of devastation and misery: the fields were deserted; there was no trade in the towns; the harbours were naked of vessels. In fact, the viceroys, aware of the precarious tenure by which they held their offices, pillaged in all directions, and the tribute or tax depended on their personal rapacity; thus both the victors and the vanquished suffered. But injustice ceased under the reign of the second Abderame, who concluded the treaty of peace with Pepin. If it be asked how he reduced a political chaos into political order, the answer of all the historians, unanimous on the point, is that he devoted himself entirely to the duties of royalty. It is true that he indulged in pleasure, and was fond of magnificent display, but his virtue eclipsed his weaknesses. He felt the necessity of peace to ameliorate the condition of his people; and commenced his reforming career by abstaining from foreign conquest. Besides his negotiation with Pepin, he made a long truce with Don Aurelio, king of Asturias, the descendant and successor of the Gothic prince, Pelayo, who, having escaped the slaughter of Xeres de la Frontera, had taken refuge in the mountains, whose poverty and ruggedness afforded him and his scanty band of followers a secure asylum against the Moslem semitar.

Abderame granted to his Christian subjects the most absolute toleration; and if, in obedience to the law of the prophet, he endeavoured to increase the number of the faithful, he only sought their conversion by the gentle persuasions of kind treatment and liberal gifts. He encouraged marriages between the Moslems and the Christians, and enriched apostates from the Cross. It is true that many members of the Spanish church remained steadfast to their creed, and some even had the boldness to preach resistance; but proselytism advanced with rapid strides, and the Koran, gilded with gold, was accepted by a large majority of the people. What most contributed to the destruction of Christianity was the temporal policy of this adroit prince, who never allowed vacant bishoprics to be filled up; and prelates, deprived of revenues, soon disappeared. Soon there was but one people; and that people, relieved from the horrors of civil war, turned its activity to trade. An active commerce with Greece and Asia Minor attracted the fleets of Byzantium into Spanish harbours, and furnished abundant markets for their rich products.

Politeness of manners and a refined elegance soon pervaded all ranks; and the rude warriors of Tarik and Musa would not have recognised their descendants. What is especially remarkable, women had shaken off the austere and saddening usages of the East, and risen from slaves to the dignity of queens, and their soft influence civilised the ferocity of man. An art of pleasing was called into existence. The favour of the fair sex was no longer to be won by ruffian violence, but by heroic feats of arms; and the field of Mars became the vestibule to the temple of the Loves and Graces. It may perhaps be asked whether the earliest traditions of chivalry were derived from the barbarians of the North, or flowed down to us from Asia with those Arabs who, on quitting Africa, were also barbarians? It is a point of controversy not yet settled, nor do we presume to solve the delicate and difficult problem.

Arabian literature also penetrated into Moorish Spain. Every branch of history was cultivated; and so varied were the studies of this people, that Sismondi notices Ben-Zaid of Cordova, and Aboul Monder of Valencia, who wrote serious histories of celebrated horses, while Alasneco recorded the lives of camels who had risen to distinction. Mohammed-Aba-Abdallah of Granada compiled a dictionary of the sciences from various Arabian works, while Averrhoes of Cordova was the great commentator on Aristotle. The natural sciences were pursued with uncommon ardour. Aben-Al-Beithar of Malaga was the author of three volumes, one on the virtues of plants, another on mineralogy and metallurgy, and the third on animals; all superior to anything hitherto published on those subjects. The Arabian code of agriculture was admirable—teaching the art of tillage, the growth of plants, and the rearing of animals. The invention of paper, introduced at Samarcand, A.D. 649, was soon carried to Moorish Spain; and the town of Satina, in Valencia, now called San Philippo, was renowned for its beautiful manufacture. They were acquainted with gunpowder one hundred years before it has been traced by European historians, for the Moors frequently employed it in their wars in Spain during the thirteenth century; and in the eleventh century they were acquainted with the compass. The glowing warmth of the literature of the Arabs permeates the songs of the Troubadours, Trouvères, and Provençal poets: and as Sismondi remarks—"All the Italian

poets have mentioned them with respect, and all the literary historians of that country have recognised their powerful influence. The Spaniards have paid them less homage. Sanchez, Father Sarmiento, Andres, and the Marquis of Santillana, have illustrated their history, and shown the connexion of the Provençal poetry with that of the Arabians and of all the romance nations." In fact, when the monarchy of the Omniades gave way in Spain, it was succeeded by a variety of petty Moorish sovereignties; and, in the meantime, many Christian principalities, or small states, had achieved their independence. To all these little courts men versed in arts and letters repaired—as to Granada, Seville, Cordova, Toledo, Valencia, and Saragossa; and when they were out of favour with the Moorish princes, they found a reception with the Christian. To these they carried the tales and fictions of the Arabians, and thus their literature was diffused, and took root; and in this manner the romance writers received the legendary style of the Moors.

The Arabian Moors, however, with all their valour, learning, and refinement, only founded on the soil of Spain a transitory dominion. The extinction of the caliphate of the Omniades of Cordova, was the commencement of their downfall; they became weakened at once by their divisions and intestine feuds, for they did not comprehend the strength to be derived from a federative union. We shall rapidly sketch the rise and progress of the growing Christian monarchy. Its beginnings were weak, its vicissitudes frequent and painful; but from its first move towards restoration, it was surrounded by circumstances which guaranteed its ultimate success.

The kingdom of the Asturias, which had sheltered Pelayo and his companions, was the first to emerge from obscurity and appear on the political scene. Narrowed at first within the territorial limits of Oviedo and its dependencies, it expanded, in less than a century to the provinces of Galicia and Leon, thus including a large part of ancient Celtiberia. This first progress was the work of Alphonso the Catholic, who died in 757, leaving the crown to Froila, who was assassinated after a few years. The reign of this prince is remarkable for the attempts he made to induce the clergy to give up their concubines. The old historians indeed call them *wives—sus mugeres*, but the canons of the church bound them to celibacy. The only prince of this line who deserves historical notice, among many who flourished during the last half of the eighth century, was Alphonso II., surnamed the Chaste and the Victorious. He acquired the first of these titles by refusing to the caliph of Cordova the infamous tribute of one hundred Christian girls; he was indebted for the second to some considerable advantages he had gained over the Saracens, with whom he had long been on friendly terms. His reign is famous for the loves of his sister Chimene and Don Sancho Diaz, whose son, the celebrated Bernard de Carpio, is the well-known hero of the romance writers. However, some sceptics have denied the existence of Chimene, and treated her as a myth. During his rule the tomb of the famous St. James of Compostella was discovered, and Roland triumphed at the battle of Roncesvalles. At this epoch Navarre became a kingdom; its first sovereign was Garcia Ximenez, who died in 880. Formerly it had formed part of Aquitaine, and the counts of Gascony ruled it as vassals of the children of Louis le Débonnaire. At the same period the countship of Barcelona was formed, being a concession from the kings of France, as Navarre had been a dismemberment of the territories of the French monarchy.

At the commencement of the tenth century, the kingdom of Leon and Asturias, which had been greatly extended under several warlike princes, was menaced by the Moslems, who had invaded Navarre. A century of defeats had not discouraged the Moors, whose armies were constantly reinforced by fresh levies from Africa. Having captured several towns, they encountered and completely routed the Christians at Junquera. In this battle the bishops of Tyre and Salamanca, who fought on the side of Ordono II., king of Navarre, were taken prisoners. The conquerors pursued their victory, passed the mountains, and pushed on to the walls of Toulouse; but, during this imprudent expedition, Ordono rallied his troops, and ravaged the Moorish territory up to the very walls of Cordova. The Navarrese also surprised the enemy, defeated them most signally, carried off a large booty, and recovered gradually all the towns they had lost.

Some years afterwards Abderame III., at the head of an army numbering one hundred and fifty thousand men, penetrated to the centre of Castile, destroying all the towns on his route. So great

was the consternation, that the Christians despaired of repulsing such formidable foes by mere human prowess; and Ramiro II., king of Leon, went on a pious visit to the tomb of St. James of Compostella, and vowed to pay him a tribute of wheat if he obtained a victory. He then united his arms to those of the king of Navarre and of the counts of Castile, and defeated the Moslems at Simancas, near the confluence of the Pisuerga and the Douro, on the 6th of August, in the year 938.

Shortly after this triumph the counts of Castile, who were vassals of the king of Leon, revolted, and aimed at establishing an independent kingdom; but Ordono II. strangled them. Under his successor, Alphonso IV., the people of Castile, irritated at this murder, shook off the yoke, and elected a chief; but some historians state that they founded a republic, at the head of which they placed two judges, one civil, the other military. This form of government, if it ever existed, was ephemeral: the children of the strangled counts still lived; they were set at liberty, and a reconciliation was effected by the marriage of Donna Urraqua with the son of Ordono, then a child. It was during the minority of this child, who became Ramiro III., that the famous constable of Castile, Ferdinand Gonzalez, father of Urraqua, by frequent victories over the Moors, won the love and confidence of the people, and rendered himself independent. At the end of the tenth century, Castile was established as a kingdom, and took rank with those of Leon and Navarre. From this period the political aggregations of Spain acquired a certain degree of solidity.

reigne at Toledo, Valencia, Orihuela, and Saragossa; so that, in fact, all the principal towns of the divided monarchy became the capitals of petty kingdoms; hence the multiplicity of states in Spain, and the multitude of titles which the kings of Spain preserve to the present day.

Ferdinand I. of Castile, in concert with his brother, the king of Navarre, made war on the king of Leon and Asturias, defeated and slew him, and incorporated his dominions with Castile; and thus one Christian kingdom disappears from the page of history. Then terminated the second race of Gothic kings, descended from Pelayo and Alphonso the Catholic, who had reigned over the Asturias for three centuries, and steadily attempted to deliver Spain from the Moslem yoke; but during that long period they only recovered one half of what the Moors had conquered in three years. These still retained considerable provinces, stretching along the coast of the Mediterranean from the Pyrenees to Gibraltar, and skirting the Atlantic from Tarifa Point to the mouth of the Tagus, and beyond that river to the Douro. Along this immense line they held important places. Toledo and a part of New Castile was still in their possession, and Barcelona obeyed a Saracen emir. This long chain of coast secured to them nearly the whole commerce of the peninsula. The African immigration continued to repair the losses of war. The Christian princes had not the same resources; and this circumstance enhances our admiration of their constancy and valour. Ferdinand I., celebrated in the annals of Castile, possessed warlike talents, but was stained with vice. By the foulest treachery



MOORISH BAS-RELIEF.

It was at this period that a circumstance occurred which shows in a strong light the chivalrous honour which prevailed both among the Moors and Spaniards: Sancho, brother to Ordono III., being afflicted with dropsy, went to Cordova, and placed himself under the treatment of the Moorish physicians, who enjoyed a high reputation.

At the end of the tenth century, Almanzor, a Moorish general, threatened to exterminate all the Christian kingdoms of Spain, which had gradually struggled into existence. He invaded the kingdom of Leon, and only left a single tower standing in the capital, as a memorial that it had once existed and had perished. The Christian princes saw their peril, and wisely united all their forces; and, at the end of a fierce battle, which lasted from morning till night, Almanzor was defeated. He was truly a great man. He was liberal to the Christians, and many, attracted by his fame, ranged themselves under his banner. In the administration of justice, he made no distinction between the Jew, the Christian, or the Mahometan. Many, indeed, of these Moslem princes were endowed with the noblest qualities, and the most eminent talents; and even the Catholic writers, though prejudiced against them on account of their religion, accord to them this praise.

Between the years 1030 and 1050, the beautiful kingdom of Cordova was dismembered by the intestine feuds of the Moslems. At this epoch commences the decline of Mahometan prosperity in Spain, founded, as we have seen, towards the middle of the eighth century, by Abderrame I. After some years of anarchy, the throne of Cordova devolved on the strongest or most adroit of the various competitors: and the others made themselves sove-

he assassinated his brother, the king of Navarre, and his brother-in-law, the king of Leon; but as he distinguished himself by his Catholic zeal, and rendered the Moorish king of Toledo his tributary, the church has honoured him as a saint. On the eve of his death, he prostrated himself before the relics of St. Isidore, and prayed with fervour: "Then," says his Jesuit biographer, "he expired tranquilly in the arms of several bishops, and crowned his military laurels with celestial palms." This prince, however, although a murderer through ambition, enacted several useful laws; and, among others, prohibited the clergy from bearing arms. In his reign flourished the famous Don Rodrigo Diaz de Bivar, celebrated under the name of the Cid by native and foreign poets. At the death of Ferdinand, in 1064, he divided his dominions among his three sons, and civil war immediately followed. One of these, Sancho, called the Strong, stripped his brothers of all their share; and even despoiled his sisters of their inheritance.

We may here pause and survey the state of Spain at this epoch. The Christian princes had four principal kingdoms—Leon, Castile, Aragon, and Navarre. All were weakened by constant divisions and internecine wars. No regular rule of succession to vacant thrones was established; while the feudal barons were constantly invading the territories of each other. The principle of legitimacy was determined by strong hand or assassination. Such a state of things reduced the people to misery. The laws were in many respects good, but their goodness prevented their execution. This anarchy was favourable to the Moors, who never dreaded any united attack; and to this circumstance, more than to any other, must be ascribed their prolonged rule. At the period at which we

have arrived in this narrative, that is to say, at about the close of the eleventh century, the Moorish dynasty of the Almoravides arose in Spain. That warlike tribe, having recently quitted the deserts of Africa, brought with them into the peninsula all their primitive ferocity and that hatred of the Christian name, which had been greatly modified among the descendants of the first invaders. These new tribes seized Seville, Murcia, and advanced to the Tagus; they vanquished the Christian armies at Toledo in a sanguinary battle, called "*the battle of the Seven Counts*," for there perished seven counts of Castile, as well as the son of King Alphonso VI., a mere youth. A surviving brother, Alphonso VII., in 1126, undertook an expedition against the Moors, and ravaged Andalusia. The king of Aragon also attacked the infidels in Catalonia, where he was killed. It was during the reign of Alphonso VII. that the military order of the Knights of Calatrava was instituted. Its founders were two monks, who had worn the cuirass before they assumed the frock. They belonged to the order of St. Bernard; and offered to defend Calatrava, threatened by the Moors, on condition of receiving the feudal lordship of the town. To this the king consented; and the two leaders equipped an army of twenty thousand men, most of whom were monks, and effectively resisted the Mahometans. Their example was followed; and it gave rise to most of the military orders of Spain. Then were established the Knights of Alcantara and the Knights of St. James; the special duties of the latter being to protect pious pilgrims visiting the shrine of St. James of Compostella, whose miracles had already created a lucrative traffic.

Ferdinand died, and his brother Sancho took the command of the Christian army. He became so popular, that he was elected regent during his father's absence; who, on his return from his useless journey, was abandoned by his subjects. The Moorish invasion had then ceased; and Alphonso took the extraordinary step of soliciting the aid of the king of Morocco to expel his son from the authority he had usurped. This appeal was successful: the Moorish king crossed the straits with an army, to succour the Christian sovereign, whom he is said to have addressed in the following terms:—"I assist you because you are unfortunate, and the only object of the alliance I now contract with you is to vindicate the common cause of all kings, and of all fathers." The annals of Christian monarchies have never recorded more noble and exalted sentiments. But Alphonso did not recover his dominions. The people adhered firmly to his rebellious son: the unfortunate monarch implored the assistance of France, which was refused, and the Pope only excommunicated his enemies, who did not yield to the thunders of the Vatican. Alphonso died an exile from his throne.

From this period to the reign of Ferdinand and Isabella, the Christian and Moorish history is not marked by any signal events, it being only a repetition of alternate reverses and successes. One of the chief incidents was an attempt by Alphonso XI. to recapture Gibraltar, which had been given up to the Moors by a disloyal governor. His army was thinned by a pestilence, to which he fell a victim. The reign of Peter the Cruel, so far as it relates to the infidels, is only remarkable for the usurpation of the throne of Granada by Mahomet Lagus, who assassinated Jousouf, the legiti-



SECTION OF COURT OF LIONS.

mate king. Mahomet the Red dethroned Lagus, and seized the sceptre. Fearing Peter the Cruel, he formed an alliance with the king of Aragon; but this was quickly dissolved, and Peter undertook the restoration of Lagus. Then Mahomet the Red imprudently resolved on personally visiting the king of Castile, accompanied by a small retinue, sumptuously accoutred, and taking with him precious stones of great value. Peter received him graciously, and pretended to negotiate with him; then caused him to be dragged from the table at which he was seated, loaded him with chains, and exhibited him mounted on an ass in the streets of Seville. The unfortunate Moor and his thirty-seven attendants were put to death, Mahomet Lagus ascended the throne, and became tributary to Castile.

Henry III., son of John I., who died in 1390, had the courage or the rashness to attempt to reign at the early age of fifteen; and was the first sovereign who seriously contemplated the complete expulsion of the Moors from Spain. At his death the Castilians desired to break through the ordinary rules of succession, and pass over the claim of Don John II., yet a minor, as they dreaded the rivalry of the nobles under a regency. They offered the crown to his uncle Ferdinand, who refused it; but he was elected king of Aragon by the Cortes of that kingdom; and after his marriage with Isabella, queen of Castile, he expelled the infidels from Spain.

From this rapid sketch of the history of the peninsula under the Romans, Goths, and Mahometans, we pass to those civil wars which terminated in the expulsion of Boabdil, the last king of the Moors, connecting with that narrative a description of the ALHAMBRA.

The Spanish and Moorish chronicles of Granada are so contradictory, so mixed up with fable, and so highly-coloured and distorted by party spirit and national prejudice, that it is extremely difficult to reconcile conflicting statements; and this difficulty increases when we arrive at the civil wars, the quarrels between the Zegries and Abencerrages, and have to treat of those events which facilitated the conquest by Ferdinand and Isabella. There is a volume entitled *Las Guerras Civiles*, translated from the Arabic of Abenhanim, a native of Granada, by Ginès Perez di Hita of Murcia, which is full of minute details of the civil war. This translation was completed, published, and printed at Alcalá, in 1601, and dedicated to Don John of Aragon. Ginès Perez affirms that the Arabic original which he translated was in the possession of Don Manuel Ponce de Leon, Lord of Baylen. From the Spanish it was again translated into English by Mr. Rodd, who expressed his perfect faith in its authenticity. This volume contains a very detailed account of the massacre of the Abencerrages in the Hall of Lions, in the Alhambra; and fixes the murder on Boabdil, pronounced innocent by Washington Irving after a careful investigation. From this book, *Las Guerras Civiles*, we take the following account of the foundation of the city of Granada and of the Alhambra:—

"The illustrious and renowned city of Granada was founded by a very fair lady, the daughter or niece of King Hispan. It was originally built in a delightful spacious plain, at the foot of the Sierra Elvira, near the village of Albolete (In Arabic, Albolut), about two leagues from its present situation, receiving the name of Hiberia from the infanta, its foundress.

"After a few years the inhabitants, not being altogether pleased with the spot, removed to the neighbourhood of Sierra Nevada, and built the present city between the two rivers Genil and Darro, formed by the melting of the snow on the mountains. In the sands of the Darro is found gold, and in the Genil, silver (as the Moorish author relates); and this is no fable, as Ginès Perez adds that he has repeatedly seen both gold and silver collected out of these rivers. In this latter situation was this famous city refounded, upon three hills, as it appears at the present day; and upon each of these hills a castle was erected; the first called the Red Tower, fronting the Genil and the Vega, or the plain (a plain twenty-four miles in length, and twelve in breadth, watered by two small streams, the Vélto and the Monachil, extending from the skirts of the Sierra Nevada to the fountain of Pines, and onward to a great wood, called the Wood of Rome), and the quarter of the city immediately round the Red Tower, which is extremely populous, is called Antequera. The second castle, or fortress, stands upon an adjoining hill, rather higher than the former, and is called the Alhambra; this being a place of considerable strength, was chosen for the residence of the kings of Granada. The other castle, or fort, stands upon a third hill, named the Albaycin, where also the town is very full of inhabitants. Between the Albaycin and the Alhambra flows the Darro, whose banks are beautifully adorned with trees.

"This city was not like the former called Hiberia, but Granada; from the circumstance of a very beautiful damsel, called Granata, being found in a cave near the Darro, and from whom, by the corruption of a letter, the city took its new appellation. Others, with equal probability, suppose that the vast number of houses lying close together, like the kernels of a pomegranate, gave origin to the name.

"It was King Muley-hascem who adorned Granada with so many noble works. He built the most superb edifices with his great wealth; he ornamented and finally completed the Alhambra in a very costly style; built also the Tower of Comares* and the Hall of Lions,† which takes its name from a spacious basin in the middle of it, guarded by twelve large alabaster lions, very curiously sculptured. The whole saloon is paved with fine tiles, after the Moorish fashion. Muley-hascem also dammed up the waters of the Alhambra, and made the famous reservoir within it; built the Tower of the Bell, whence the whole city and the Vega may be seen at a view; he also planted a large grove close beneath the royal apartments of the Alhambra, or rather a park, which he well stocked with deer and rabbits, and which continue to this very day. He caused the Alixares to be covered over with blue and gold—a work of so costly a nature that the artificer who undertook it gained a hundred doubloons every day. He built also a pleasure-house on the Hill of the Sun, or (as it is now called) of St. Helene,

and another for his poultry. He had, moreover, a delightful garden on the banks of the Darro; it contained all manner of fruits, beautiful alabaster fountains, seats, and walks, planted with myrtles. There also Muley-hascem built a noble palace, with many saloons, balconies, and windows superbly gilt; and in the principal saloon he placed the portraits of all the Moorish kings of Granada to his time, finished by the most eminent hands; and in a second apartment, all the battles of the Moors and Christians, most admirably executed. In short, the palaces and public buildings of Granada were so strong and sumptuous, that most of them (and indeed all that have not been expressly demolished) remain entire to this very day."

Mr. Swinburne gives the following account of this celebrated edifice:—

"I confess," says that intelligent traveller, "I was struck with amazement, as I stepped over the threshold, to find myself on a sudden transported into a species of fairyland. The first place you enter is the court called the *communa*, or *del mesucar*, that is, the *common baths*; an oblong square, with a deep basin of clear water in the middle; two flights of marble steps leading down to the bottom; on each side a *parterre* of flowers and a row of orange-trees. Round the court runs a *peristyle*, paved with marble; the arches bear upon very slight pillars, in proportions and style different from all the regular orders of architecture. The ceilings and walls are incrustated with fretwork in stucco, so minute and intricate that the most patient draughtsman would find it difficult to follow it, unless he made himself master of the general plan. In every division are Arabic sentences of different lengths, most of them expressive of the following meanings:—"There is no conqueror but God;" or, "Obedience and honour to our lord Abou-abdoulah." The ceilings are gilt or painted; and time has caused but little diminution in the freshness of their colours, though constantly exposed to the air. The lower part of the walls is mosaic, disposed in fantastic knots and festoons. The porches at the ends are more like grotto-work than anything else to which they can be compared. That on the right hand opens into an octagon vault, and forms a perfect whispering-gallery, meant to be a communication between the offices of the houses.

"Opposite to the door of the *communa* through which you enter, is another leading into the *cuarto de los leones*, or apartment of the lions; which is an oblong court, one hundred feet in length and fifty in breadth, environed with a colonnade seven feet broad on the sides and ten at the end. Two porticoes, or cabinets, about fifteen feet square, project into the court at the two extremities. The square is paved with coloured tiles; the colonnade with white marble. The walls are covered five feet up from the ground with blue and yellow tiles, disposed chequerwise. Above and below is a border of small escutcheons, enamelled blue and gold, with an Arabic motto on a bend, signifying, 'No conqueror but God.' The columns that support the roof and gallery are of white marble, very slender, and fantastically adorned. They are nine feet high, including base and capital, and eight inches and a half in diameter. They are very irregularly placed; sometimes singly, at others in groups of three, but more frequently two together. The width of the horse-shoe arches above them is four feet two inches for the large ones, and three for the smaller. The ceiling of the portico is finished in a much finer and more complicated manner than that of the *communa*, and the stucco laid on the walls with inimitable delicacy; in the ceiling it is so artfully frosted and handled, as to exceed belief. The capitals are of various designs, though each design is repeated several times in the circumference of the court, but not the least attention has been paid to placing them regularly or opposite to each other. Not the smallest representation of animal life can be discovered amidst the varieties of foliage, grotesques, and strange ornaments. About each arch is a large square of arabesques, surrounded with a rim of characters that are generally quotations from the Koran. Over the pillars is another square of delightful filigree-work. Higher up is a wooden rim, or kind of cornice, as much enriched with carving as the stucco that covers the part underneath. Over this projects a roof of red tiles, the only thing that disfigures this beautiful square. This ugly covering is modern, put on by order of Mr. Wall, the late prime-minister, who a few years ago gave the Alhambra a thorough repair. In Moorish times the building was covered with large painted and glazed tiles, of which some few are still to be seen. In the centre of the court are twelve ill-made lions muzzled, their foreparts

* See Engraving, p. 30.

† Ibid., p. 52.

smooth, their hindparts rough, which bear upon their backs an enormous basin, out of which a lesser rises. While the pipes were kept in good order a great volume of water was thrown up, that, falling down into the basins, passed through the beasts, and issued out of their mouths into a large reservoir, where it communicated by channels with the *jets d'eau* in the apartments. This fountain is of white marble, embellished with many festoons and Arabic distiches, thus translated:—

"'Seest thou not how the water flows copiously like the Nile?'"
 "'This resembles a sea washing over its shores, threatening shipwreck to the mariner.'"
 "'This water runs abundantly to give drink to the lions.'"
 "'Terrible as the lion is our king in the day of battle.'"
 "'The Nile gives glory to the king, and the lofty mountains proclaim it.'"
 "'This garden is fertile in delights; God takes care that no noxious animal shall approach it.'"
 "'The fair princess that walks in this garden, covered with pearls, augments its beauty so much, that thou may'st doubt whether it be a fountain that flows, or the tears of her admirers.'"

"Passing along the colonnade, and keeping on the south side, you come to a circular room, used by the men as a place for drinking coffee and sorbets in. A fountain in the middle refreshed the apartment in summer. The form of this hall, the elegance of its cupola, the cheerful distribution of light from above, and the exquisite manner in which the stucco is designed, painted, and finished, exceed all powers of description. Everything in it inspires the most pleasing, voluptuous ideas; yet in this sweet retreat they pretend that Abouabdoulah assembled the Abencerrages, and caused their heads to be struck off into the fountain. Continuing your walk round, you are next brought to a couple of rooms at the head of the court, which are supposed to have been tribunals or audience chambers.

"Opposite to the *Sala de los Abencerrages* is the entrance into the *Torre de las dos Hermanas*, or the 'Tower of the Two Sisters'; so named from two very beautiful pieces of marble laid in the pavement. This gate exceeds all the rest in profusion of ornaments and in beauty of prospect, which it affords through a range of apartments, where a multitude of arches terminate in a large window open to the country. In a gleam of sunshine, the variety of tints and lights thrown upon this enfilade are uncommonly rich. The first hall is the concert-room, where the women sat; the musicians played above in four balconies. In the middle is a *jet d'eau*. The marble pavement is equal to the finest existing, for the size of the slabs and evenness of the colour. The two sisters, which give name to the room, are slabs that measure fifteen feet by seven and a half, without flaw or stain. The walls, up to a certain height, are mosaic; and above are divided into very neat compartments of stucco, all of one design, which is also followed in many of the adjacent halls and galleries. The ceiling is a fretted cove. To preserve this vaulted roof, as well as some of the other principal cupolas, the outward walls of the towers are raised ten feet above the top of the dome, and support another roof over all, by which means no damage can ever be caused by wet weather or excessive heat and cold. From this hall you pass round the little myrtle-garden of Lindaraxa into an additional building, made to the east end by Charles V. The rooms are small and low. His dear motto, '*Plus outré*,' appears on every beam. This leads to a little tower, projecting from the line of the north wall, called *El Tocador*, or the 'Dressing-room of the Sultana.' It is a small square cabinet, in the middle of an open gallery, from which it receives light by a door and three windows. The look-out is charming. In one corner is a large marble slab, drilled full of holes, through which the smoke of perfumes ascended from furnaces below; and here, it is presumed, the Moorish queen was wont to sit to fumigate and sweeten her person. The emperor caused this pretty room to be painted with representations of his wars and a great variety of grotesques, which appear to be copies, or at least imitations, of those in the loggie of the Vatican. From hence you go through a long passage to the Hall of Ambassadors, which is magnificently decorated with innumerable varieties of mosaics, and the mottoes of all the kings of Granada. This long narrow antechamber opens into the communa on the left hand, and on the right into the great audience-hall in the Tower of Comares; a noble apartment, thirty-six feet square, thirty-six high up to the cornice, and eighteen from thence to the centre of the cupola. The walls on three sides are fifteen feet thick, on the other nine; the lower range of windows thirteen feet high. The whole wall is inlaid with mosaic of many

colours, disposed in intricate knots, stars, and other figures. In every part various Arabic sentences are repeated.

"The most remarkable room below is the king's bedchamber, which communicated, by means of a gallery, with the upper story. The beds were placed in two alcoves, upon a raised pavement of blue and white tiles; but as it was repaired by Philip V., who passed some time here, it cannot be said how it may have been in former times. A fountain played in the middle, to refresh the apartment in hot weather. Behind the alcoves are small doors, that conduct you to the royal baths. These consist of one small closet with marble cisterns for washing children, two rooms for grown-up persons, and vaults for boilers and furnaces, that supplied the baths with water and the stoves with vapours. The troughs are formed of large slabs of white marble; the walls are beautified with partlycoloured earthenware; light is admitted by holes in the coved ceiling. Adjoining is a whispering-gallery and a kind of labyrinth, said to have been made for the diversion of the women and children. One of the passages of communication is fenced off with a strong iron grate, and called 'the Prison of the Sultana,' but it seems more probable that it was put up to prevent anybody from climbing into the women's apartments.

"Under the council-room is a long slip called 'the King's Study'; and adjoining to it are several vaults, said to be the place of burial of the royal family. In the year 1754, four sepulchres were opened; but, as they contained nothing but bones and ashes, were immediately closed again.

"This description of the Alhambra may be finished by observing how admirably every thing was planned and calculated for rendering this palace the most voluptuous of all retirements; what plentiful supplies of water were brought to refresh it in the hot months of summer! what a free circulation of air was contrived by the judicious disposition of doors and windows! what shady gardens of aromatic trees! what noble views over the beautiful hills and fertile plains! No wonder the Moors regretted Granada; no wonder they still offer up prayers to God every Friday for the recovery of this city, which they esteem a terrestrial paradise."

Mr. Washington Irving, a comparatively recent visitor to the Alhambra, has collected some of the romantic fables connected with this building, and described many points of detail which have been overlooked by earlier writers. "The great vestibule, or Porch of the Gate, is formed by an immense Arabian arch, of the horse-shoe form, which springs to half the height of the tower. On the keystone of this arch is engraved a gigantic hand. Within this vestibule, on the keystone of the portal, is sculptured, in like manner, a gigantic key. Those who pretend to some knowledge of Mahometan symbols, affirm that the hand is the emblem of doctrines, and the key, of faith; the latter, they add, was emblazoned on the standard of the Moslems when they subdued Andalusia, in opposition to the Christian emblem of the cross. The interior of the Moorish palace is paved with white marble, and decorated at each end with light Moorish peristyles; it is called the Court of the Alberca. In the centre was an immense basin, or fishpond, one hundred and fifty feet in length by thirty in breadth, stocked with golden fish, and bordered by hedges of roses. At the upper end of this court rose the great Tower of Comares. From the lower end we passed through a Moorish archway into the renowned Court of Lions. There is no part of the edifice that gives a more complete idea of its original beauty and magnificence than this, for none has suffered so little from the ravages of time. In the centre stands the fountain famous in song and story. The alabaster basins still shed their diamond drops; and the twelve lions which support them cast forth their crystal streams as in the days of Boabdil. The court is laid out in flower-beds, and surrounded by light Arabian arcades of open filigree-work, supported by slender pillars of white marble. The architecture, like all other parts of the palace, is characterised by elegance rather than grandeur, bespeaking a delicate and graceful taste, and a disposition to indolent enjoyment. When one looks upon the fairy tracery of the peristyle and the apparently frigid fretwork of the walls, it is difficult to believe that so much has survived the wear and tear of centuries. On one side of the court, a portal, richly adorned, opens into a lofty hall, paved with white marble, and called the 'Hall of the Two Sisters.' A cupola, or lantern, admits a tempered light from above, and a free circulation of air. The lower part of the walls is encrusted with beautiful Moorish tiles, on some of which are emblazoned the escutcheons of the Moorish

monarchs; the upper part is faced with the fine stucco-work invented at Damascus, consisting of large plates, cast in moulds and artfully joined, so as to have the appearance of having been laboriously sculptured by the hand into light reliefs and fanciful arabesques, intermingled with texts of the Koran, and poetical inscriptions in Arabian and Cufic characters. These decorations of the walls and cupolas are richly gilded, and the interstices pencilled with lapis-lazuli and other brilliant and enduring colours. The opposite side of the Court of Lions is the Hall of the Abencerrages, so called from the gallant cavaliers of that illustrious line, who were here perfidiously massacred. The Tower of Comares, so called from the name of the Arabian architect, is of massive strength and of lofty height, domineering over the rest of the edifice, and overhanging the steep hill-side, which descends abruptly to the banks of the Darro. A Moorish archway admitted us into a vast and lofty hall, which occupies the grand audience-chamber of the Moslem monarchs. It still bears the traces of magnificence. The walls are richly stuccoed and covered with arabesques; the vaulted ceiling of cedar-wood, almost lost in obscurity from its height, still gleams with rich gilding and the brilliant tints of the Arabian pencil. On three sides of the saloon are deep windows, cut through the immense thickness of the walls, the balconies of which look down upon the verdant valley of the Darro, and command a distant prospect of the distant Vega."

When the crowns of Castile and Aragon were united by the marriage of Isabella and Ferdinand, Spain acquired the strength of political unity; and during their reign appeared the greatest of Spanish statesmen, the famous Cisneros, Cardinal Ximenes. Under these circumstances, the fall of Granada and the extirpation of Moorish power were almost certain, especially as the two sovereigns, the minister, and all the chivalrous nobility, were resolved on the expulsion of the infidels; but there can be no doubt that the victory of the Christian princes was greatly aided by internal dissensions among the Moslems. Indeed, many of their most illustrious families, disgusted by the horrors and cruelties of civil war, had been baptised into the Christian faith, and fought in the ranks of Ferdinand and Isabella in the last campaigns. Of these domestic quarrels the chief cause was the massacre of the Abencerrages, one of the oldest and most celebrated of the Moorish nobility, who traced their lineage to the kings of Morocco, and whose ancestors came into Spain at the time of the conquest under Musa. This massacre is generally attributed to Boabdil, the last king of Granada, who has found an advocate in Mr. Washington Irving, by whom he is acquitted of that foul murder. "I have examined," says that writer, "all the authentic chronicles and letters written by Spanish authors contemporary with Boabdil, some of whom were in the confidence of the Catholic sovereigns, and actually present in the camp throughout the war. I have examined all the Arabian authorities I could get access to, through the medium of translation, and can find nothing to justify these dark and hateful accusations." According to this writer, the guilty perpetrator of this assassination was Aben-Hassan, called generally by the Moorish historians, Muley-hascem, who was the father of Boabdil, and who suspected the Abencerrages of being engaged in a conspiracy to dispossess him of his throne. "Aben Hassan," he continues, "in his advanced age, married a beautiful Christian captive of noble descent, who took the Moorish name of Zorayda, by whom he had two sons. She was of an ambitious spirit, and

anxious that her children should succeed to the crown. For this purpose she worked upon the suspicious temper of the king, inflaming him with jealousies of his children by his other wives and concubines, whom she accused of plotting against his throne and life. Some of them were slain by their ferocious father. Aixa la Horra, the virtuous mother of Boabdil, who had once been his cherished favourite, became likewise the subject of his suspicion. He confined her and her son in the Tower of Comares, and would have sacrificed Boabdil to his fury, but that his tender mother lowered him from the tower in the night by means of the scarfs of herself and her attendants, and thus enabled him to escape to Guadix.

If this account be the true one, Boabdil was the persecuted, not the persecutor; it was his mother, not his wife, who was imprisoned. But the Moorish and Spanish historians give a very different version of these transactions, which we proceed to relate.

In *Las Guerras Civiles*, to which we have referred, Abdallah, brother of King Muley-hascem, or Aben-Hassan, as Mr. Irving calls him, makes a speech to the citizens of Granada, during one of the disturbances which were so frequent just before the conquest by Ferdinand and Isabella. In consequence of the quarrels between the father and son, this Abdallah had been created regent by a large body of the discontented party, though his rule was not

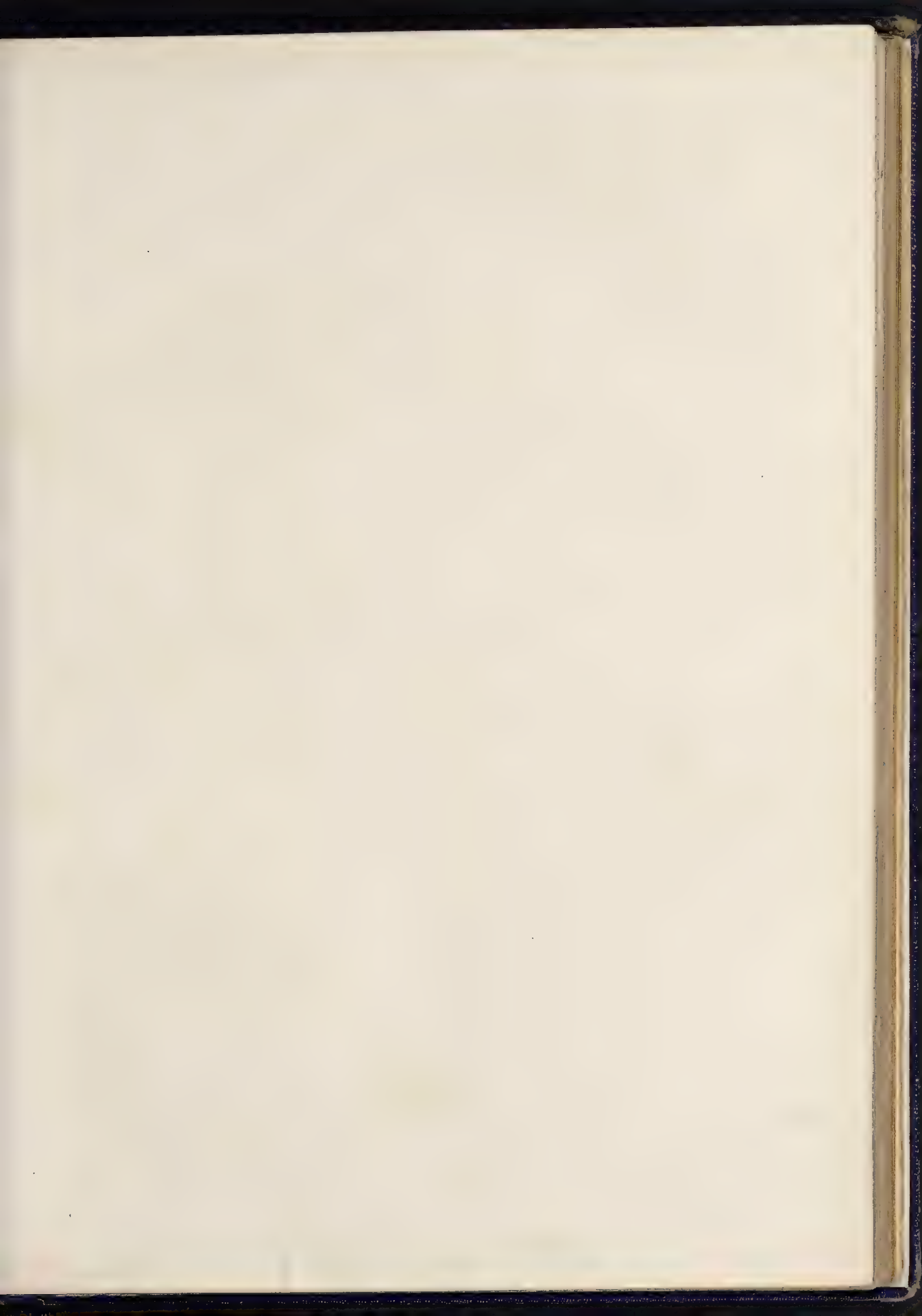
obeyed by all. He thus addressed the people:—"You who have objected to my government, without investigating the reasons of my conduct, to you I address myself: you well know that my nephew has been raised to the throne in the lifetime of King Muley-hascem, my brother, for no other reason than because the old king, his father, had beheaded four Abencerrages, who were justly deemed deserving of death; for this you withdrew your allegiance from the old king, and appointed Boabdil his son to be your king and to reign over you; this son, by the advice of some of you here assembled, has most wrongfully put to death six-and-thirty Abencerrages, and wickedly accused his queen. For these deeds of death, and unjust proceedings, you can no longer retain your former

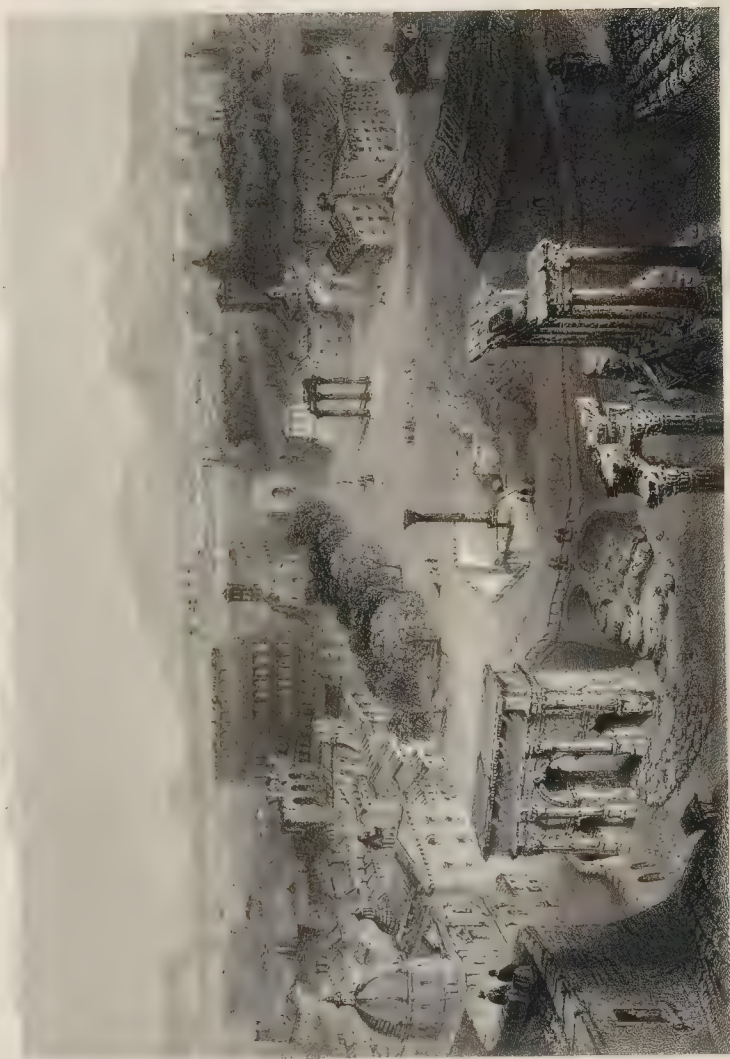
affection for him, but must consider him undeserving henceforth to wear the crown."

This statement fixes the execution of the Abencerrages on both father and son, but at different dates and for different reasons. The act of Muley-hascem is justified, for the Abencerrages appear to have been traitors to him, although he was deposed for their punishment; but the act of Boabdil is stigmatised as unjust. According to *Las Guerras Civiles*, a jealousy arose between the two powerful houses of the Zegries and the Abencerrages; and the former accused one of the latter with adultery with Boabdil's wife, and also with a desire to seize the government. Boabdil credited these false charges, but dared not openly take vengeance; he hit on the following cruel stratagem.—Surrounding himself by several of the Zegries, he summoned the Abencerrages, one by one, to the Alhambra, and as they entered, the executioner struck off their heads. When thirty-six had been massacred, a young page, who had seen his master murdered, made his escape, and met others of the devoted tribe who were on the way to obey the summons of the king. Thus warned, they saved their lives, and, quitting Granada, took refuge at the court of Ferdinand and Isabella, became Christians, and served those sovereigns faithfully and valiantly in the conquest. Nor is this the only charge which the historians bring against Boabdil. He had a sister, named Morayma, who had married Abin Hamet, one



COURT OF THE FISHPOND.





Temple of Mars Ultor in the Forum of Augustus

of the Abencerrages, and one of the victims of the king's anger. She was now a widow with two children, the eldest five, the youngest three years of age. She presented herself before her brother with her children, imploring his clemency, for she feared that they would share the fate of their father. He assailed her with bitter reproaches; and far from respecting her maternal feelings, told her that she had better cast the infamous branches, sprung from so vile a trunk, into the consuming fire. "This," he continued "would have been a sister's office; but since you have not done it, I will myself discharge the duty." So saying, he seized the eldest of the boys, plunged his poinard into his heart, and threw the body on the ground; he then caught up the other boy, and, at one blow, severed his head from his body, severely wounding the mother, who attempted to save her child. "Now," cried the king, "both root and branch are fallen." His rage was not yet satisfied; rushing on his sister, he also stretched her dead at his feet. "Now go," cried he, "attend thy husband, since thou so well didst love him."

The murder of the Abencerrages, whether committed by the father or the son, was one of the principal causes of the downfall of Granada, as it divided the strength of the Moors by civil wars. Boabdil had been taken prisoner in a fray at Loxa, but the astute Ferdinand gave him his liberty, that his presence in the capital might keep alive those feuds which were the best allies of Spain. The wisdom of this policy was justified by the result; the Spanish king gained his end, and acquired the reputation of magnanimity for releasing his captive. Granada made a brave but useless resistance. When the city surrendered, Boabdil presented the keys of

the city to Ferdinand and Isabella on a cushion, and the conquerors entered it in triumph on the 6th of January, 1492. They offered the Moorish king a residence and a revenue in Murcia; but he retired to Barbary, where he was slain for surrendering his kingdom. The spot on which he stood when he took his farewell look at Granada is still called "The Hill of Tears." Close to it is a rock, which bears the name of "The last Sigh of the Moor;" and here, tradition records, his mother uttered her memorable reproach to her son—"You do well to weep as a woman for what you could not defend as a man!"

The conquest of Granada and the expulsion of the Moors, soon followed by the banishment of the Jews, however gratifying they may have proved to the religious feelings of the Catholic sovereigns and of their subjects, added nothing to the wealth or grandeur of Spain. No race of agriculturists succeeded comparable with the Moors; industry declined, and the fertile Vega exhibited a lazy or unskilful culture. The Inquisition was established, to extirpate by tortures whatever portion of Mahometanism the sword had spared; fanatical zeal then sought new victims in the unhappy disciples of Moses; and the successors of Torquemada and Ximenes, emulous of the degrading fame of their predecessors, wreaked their furies on suspected Spaniards when Moors and Hebrews had been exterminated. The poetical complaints of Virgil on the decay of Italian agriculture, may be applied to Spain since the expulsion of the Moors, even down to our own times:—

"Non ullus aratro
Dignus honor, squalent abductis arva colonis."

THE ROMAN COURT.

THE Roman, Pompeian, and Italian Courts, separate and distinct within the walls of the Crystal Palace, are intimately connected together in their historical and artistic relations. They are component parts of the same series or group, illustrating the life of the same people at different eras. The city of Romulus cannot be severed from the city of the Popes; and what remains of Herculaneum and Pompeii must for ever be associated with the age of the Cæsars. Generations pass away, but their monuments survive: modern Rome still retains some of the noblest structures of antiquity in their original form; and it is known that Christian churches have been built from the materials of pagan temples. The most beautiful specimens of sculpture which now adorn existing museums or galleries once embellished the *thermæ* or baths of the emperors; we may still judge of the magnificent utility of the sewers and aqueducts of the olden time from the fragments yet visible; and in every region of the seven hills the classical scholar traces the giant footsteps of the ancient mistress of the world. It is from this point of view that we shall treat this division of our subject, regarding ancient and modern Italy as a whole, however diversified in its aspects at the various periods of its rise and progress, fall and restoration.

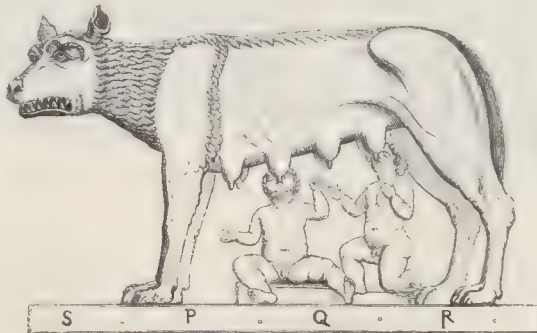
The early inclosures of Rome are thus described by Canina, a modern architect, who has devoted many years to a careful investigation of this curious and interesting subject:—

"The original city which Romulus founded, or others before him, according to many opinions was built on the Palatine Mount only; and Romulus determined its limit by a furrow which he ploughed round the hill, following the Etruscan rites. This furrow was commenced, according to the description of Tacitus, from the Forum

Boarium,* where there was placed a bull of bronze, in memorial of this animal having been at that time subject to the plough; and there was enclosed in the interior of the circumference the grand altar of Hercules. Thence Romulus, placing stones at certain distances on the side of the Palatine Hill, approached to the altar of Consus, which stood near to the great circus, and then passed by the old Curia to the temple of the household gods, and to the Forum Romanum. In this manner was inclosed the square Rome

(*Roma Quadrata*), so called by the ancients from the figure presented by the space round the hill; and from this operation originated the *pomerium*, by which the limits of towns were determined in subsequent times. In the fortification of this circle, with walls and towers in order to give Rome security from the arms of the Sabines (as Dionysius has written), three gates are principally noticed by Pliny to have been made; the names of two only are accurately known—one called Mugonia, and the other Romana or Romanula. The first was placed where Romulus began the furrow to describe the circle round

his city, and the second in the centre of the eastern side of the hill. By the agreement made after the Sabine war between Romulus and Titus Tatius, to Rome squared and to the Tarpeian Hill (which was united to the city) was added part of the other two hills—one called the Quirinal, and the other the Celian. This last hill Romulus held with the Palatine; and the Quirinal with the Tarpeian were assigned to Titus Tatius. Numa Pompilius amplified the circuit of the walls by inclosing that part of the Quirinal which had been occupied by Tatius, and by those who with him were united to the Roman people. The Celian Hill, inhabited from the time of



THE BRONZE WOLF OF THE CAPITOL.

* This was the cattle-market.

Romulus, was surrounded with walls by Tullus Hostilius, successor to Numa, when, after having destroyed Alba, he conducted the Albans to inhabit his own city; and, in order that the hill might be more quickly inhabited, Tullus erected there his palace, and made it his residence. Dionysius and Livy narrate that under the reign of Ancus Martius, the Aventine was united to the city; and being encompassed by walls and ditches, was inhabited by people transported from Tellene, Politorium, and other cities then subdued. Under the same Ancus Martius, they girt the walls with that part of the Janiculum which looks towards the Aventine, thereby to establish a fortification of defence for those who navigated the river, against the Etruscans, and this was united to the city by means of the Sublician bridge. All these inclosures being evidently built with little solidity, and in a coarse manner, as stated by Dionysius, Tarquinius Priscus was led to undertake their reconstruction with large stones cut in a regular form; but the execution of this work was suspended—first, by a war he had with the Sabines, and, secondly, by his death. This was the last enlargement of the city; and thus, by adding to the five hills—the Palatine, Capitoline, Aventine, Celian, and Quirinal—the two others, namely, the Viminal and

Pomœrium indicated the line, traced by the plough, on which the wall was built. Some derive it from *pone mœnia* or *pone muros*, place the walls; it is commonly understood to have been a certain space about the walls of a city or town, as well within as without, in which it was not lawful to plough, dwell, or build. No person was allowed to extend the pomœrium, unless he had extended the limits of the empire. Aulus Gellius states that the most ancient pomœrium, instituted by Romulus, was terminated at the foot of Mount Palatine; but that pomœrium was extended at different times as the republic increased, and at length included many and lofty hills. He had a right to extend the pomœrium who had extended the territories of the Romans by taking land from the enemy. "Wherefore," continues Gellius, "it has been, and continues to be a subject of inquiry why, out of the seven hills of the city, as there are six within the pomœrium, the Aventine Hill alone, which is neither far distant nor unfrequented, should be without the boundary of the pomœrium? For neither did King Servius Tullius, nor Sylla, who had the privilege of extending the pomœrium, nor afterwards Julius Caesar, when he afterwards enlarged it, include this hill within the expressed limits. Messala has assigned some



FAÇADE AND ENTRANCES TO THE ROMAN COURT.

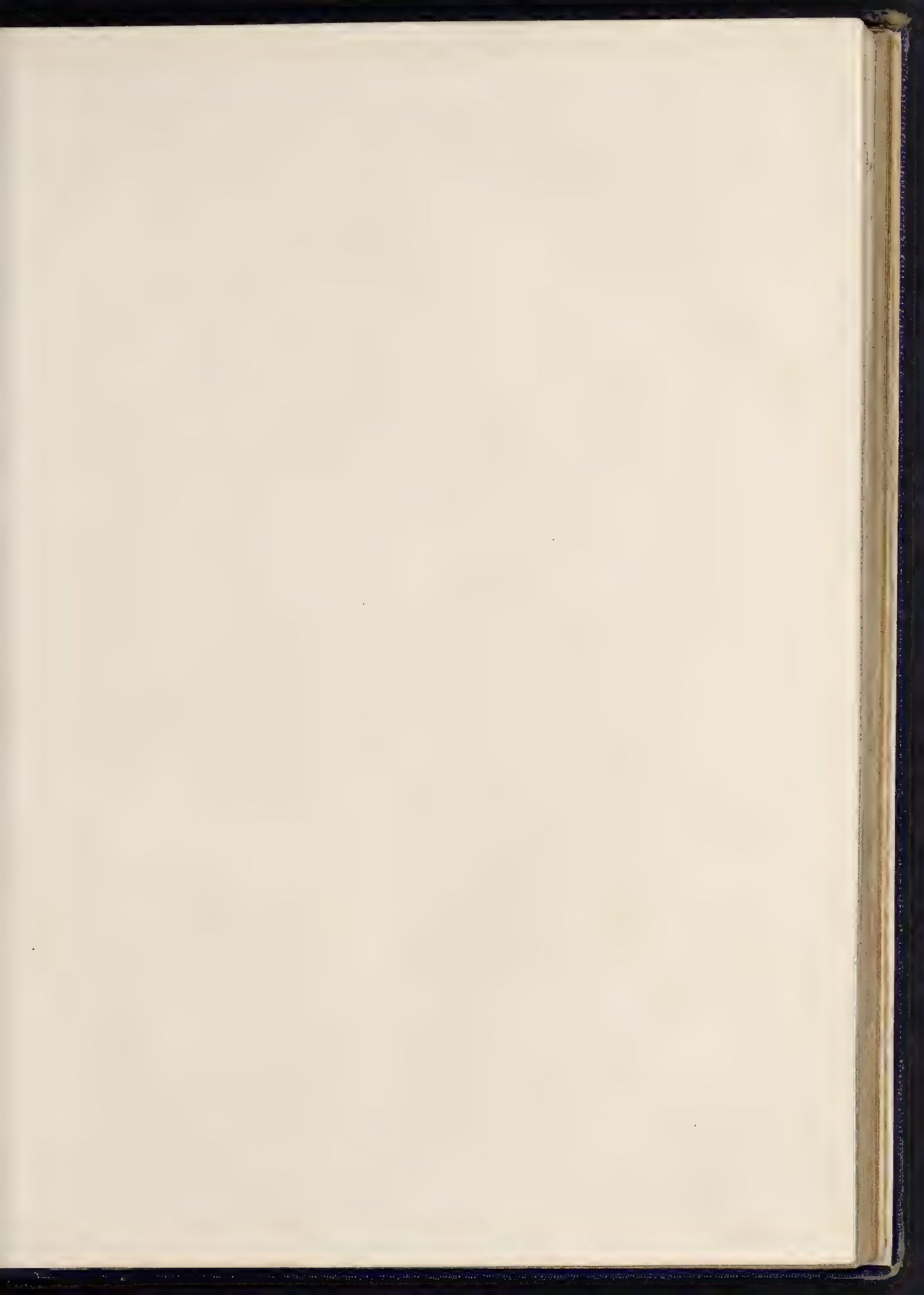
Esquiline, the city itself was composed of these seven hills, not including, however, in that number the part of the Janiculum inclosed by Ancus Martius, which in the early age of Rome was considered but as a simple fortress.*

We learn from Strabo that Servius added the Esquiline and Viminal, but as an easy opening was still left to the incursions of an enemy, that king excavated a deep fosse, and raised a bank six stadia in length, building on its summit, inside the ditch, a wall with towers, which included the space lying between the Porta Collina and the Porta Esquilina; in the centre of the bank there was a third gate called the Viminal, of the same name as the hill on which it stood. In this manner were disposed the fortifications round the city, which was without any defence. Dionysius fixes the measurement of this fosse at about one hundred feet broad and thirty feet deep, and he says that a wall was erected on its bank, supported by a high, large platform, so that it could be neither shaken by the battering-ram, nor be destroyed by mining under the foundation; this spot was about seven stadia in length.*

* The stadium was about the eighth of a mile.

probable reasons for this, one of which, in preference to the rest, he himself approves, namely, that when Remus upon that hill consulted the auspices on his intention of building the city, he found the flight of birds unpropitious, and was less fortunate in his omen than Romulus. Therefore, says Messala, all those who extended the pomœrium excluded that hill, as if it were frequented by ill-omened birds. But I must not pass over something which I lately met with concerning the Aventine Hill in the commentary of Elis, an old grammarian, in which it is recorded that, as we said before, it was formerly excluded from the pomœrium, but it was afterwards, upon the authority of Claudius Caesar, received into the boundaries, and considered as intrapomœrium."

"The seven hills of Rome," says Gibbon, "had been surrounded by the successors of Romulus with an ancient wall of more than thirteen miles. The vast enclosure may seem disproportionate to the strength and number of the infant state. But it was necessary to secure an ample extent of pasture and arable land against the frequent and sudden incursions of the tribes of Latium, the perpetual enemies of the republic. With the progress of human greatness, the city and its inhabitants gradually increased, filled up the









vacant space, pierced through the useless walls, covered the field of Mars, and, on every side, followed the public highways in long and beautiful suburbs. The extent of the new walls erected by Aurelian, and finished in the reign of Probus, was magnified by popular estimation to near fifty, but is reduced by accurate measurement to about twenty-one miles. It was a great but melancholy labour, since the defence of the capital betrayed the decline of the monarchy. The Romans of a more prosperous age, who trusted to the arms of the legions the safety of the frontier camps, were very far from entertaining a suspicion that it would ever become necessary to fortify the seat of empire against the inroads of the barbarians." The great historian adds in a note, "To confirm our idea, we may observe that for a long time Mount Cælius was a grove of oaks, and Mount Viminal was overrun with osiers; that, in the fourth century, the Aventine was a vacant and solitary retirement; that, till the time of Augustus, the Esquiline was an unwholesome burying-ground; and that the numerous irregularities remarked by the ancients in the Quirinal, sufficiently prove that it was not covered with buildings. Of the seven hills, the Capitoline and Palatine only, with the adjacent valleys, were the primitive habitations of the Roman people."

Rome traced themselves to a foreign stock. Thus Tiberius Cæsar, successor to Augustus, sprang from the patrician family of the Claudii, who came originally from Negilli, a town of the Sabines, and removed thence to Rome soon after the building of the city, with a great body of their dependents, under Titus Tatius, who reigned jointly with Romulus; and Suetonius, in his life of Tiberius, says, "among other cognomina, they assumed that of Nero, which in the Sabine language signifies strong and valiant." * This term of Nerio, Nerienes, and Nero, for thus it is variously written, Aulus Gellius thinks the Sabines borrowed from the Greeks, who called the sinews and ligaments of the limbs, *νευρα*, whence the Latin *nervos*. Nero therefore signifies warlike power and strength, and a certain martial dignity. Plautus, in his play of *Truculentus* (Anglice, "The Churl,") calls Neriene, the wife of Mars—

"Mars peregre adveniens salutat Nerienem uxorem suam."

Mrs. Gray, in her instructive and interesting *Visit to the Sepulchres of Etruria*, states that the "Etruscan remains (at Rome) are a portion of the Temple of Jupiter Capitolinus, close to the Palazzo Caffarelli, and very near the rooms of the Archaeological Society; the



ROMAN COURT.

It is well known that Romulus took from Cære, in Etruria, his religion, rites, and especially the institution of the Vestal Virgins. To a much later period the Romans consulted the Etruscan soothsayers, having faith in their superior wisdom. On this matter we learn from Aulus Gellius that "the statue in the Comitium of Rome of Horatius Cocles, a most valiant man, was struck by lightning, on account of which expiation was to be made, and soothsayers were sent for from Etruria, who, with an unfriendly and hostile disposition to the Roman people, endeavoured to counteract this expiation by opposite religious rites. They malignantly advised this statue to be removed to a lower place, that the sun, from the opposing shade of the buildings everywhere surrounding it, might never shine upon it, which, when they had persuaded to have done so, they were accused and brought before the people, and having confessed their perfidy, were put to death. Afterwards this statue was placed in a lofty position, in the area of the Temple of Vulcan."

Early Rome was not only indebted to Etruria for its religion, but for its arts, and among her first kings and teachers in the science of government were foreigners, while the most illustrious families of

Tabularium, overlooking the Forum; the Mamertine Prison; the Agger of Servius Tullius, in the gardens of Villa Negroni; the wall of Servius Tullius, now much decayed, under the Church of Santa Balbrina, on the right hand of the exit at the Porta Capena (the wall is of tufo, and constructed with alternate layers of square and oblong stones, the one row presenting their sides, and the next row their ends); a portion of the same wall adjoining the gardens of Sallust; and the tomb of the Scipios, discovered A. D. 1780. Besides these, there are walls of unknown antiquity beneath the Coliseum, the Circus Maximus, the Cloaca Maxima, and, to close all, the Bronze Wolf of the Capitol, which is mentioned as existing in the year of Rome 457, and as having been cast by Etruscan workmen." †

The Capitol was anciently both a fortress and a sanctuary. The hill on which it stood was originally called Mons Tarpeius, but it was changed to Capitolinus, because, in digging the foundations, the head of a man was there discovered—"a capite hominis ibi reperto dum foderunt fundamenta." This hill was the great seat of empire,

* "Inter cognomina autem et Neronis assumpsit, quo significatur lingua Sabinorum fortis et strenuus."—Suetonius. *De Tiberio*.

† See Engraving of the Bronze Wolf, p. 41.

and was respected both by the conquering Gauls and the victorious Porsena. Romulus began the great work of its magnificent decoration by erecting on it the Temple of Jupiter Feretrius, in which the *Spolia Opima* were deposited. These were the most honoured of all spoils, for they were taken from the king or chief of the enemy on the field of battle, when slain in single combat by a Roman general, an event only thrice commemorated. Romulus achieved this exploit by slaying Acron, king of the Cæninenses; Cornelius Cossus slew Tolumnius, king of the Veientes, A.U. 318; and M. Claudius Marcellus slew Viromarus, king of the Gauls, A.U. 330. The Temple of Jupiter Capitolinus was commenced by the Tarquins, but it is doubtful whether they completed it; it is however certain that it was not dedicated till after the expulsion of the kings, when that honour devolved on the consul, Horatius Fulvillus. It was burnt down during the civil wars between Marius and Sylla, the latter of whom commenced its reconstruction, but did not consecrate it, which duty devolved on Quintus Catulus. Varro states that he well remembered what Quintus Catulus said on this occasion—that he wanted to depress the area of the Capitol, that the flight of steps to the temple might be proportioned to the magnitude of the building, but that he was unable to accomplish this, as the *favissæ* prevented him. We learn this from Aulus Gellius, who describes the *favissæ* as cellars or caverns which were underground, beneath the area, where the images were anciently deposited, with various other things from amongst the sacred offerings. In the same letter he confesses himself unable to determine why they were called *favissæ*, but affirms that Q. Valerius Soranus was accustomed to say that what we in Greek called treasures, the old Latins called *favissæ*, because they did not there deposit brass and silver in the mass, but money cast (*stata*) and stamped. It may be conjectured, therefore, that the second letter was taken from this word, and that certain cells and caves, which the wardens of the Capitol used as depositories for ancient things belonging to religion, were thence called *favissæ*. The learned Mr. Beloe, in a note on this passage of Gellius, thinks that the derivation of the word from *favissæ* is far-fetched and absurd; it seems more natural, he adds, to derive it from *favio*, an old Latin word for *fodio*. It does not appear that the Romans had any cellars for domestic uses beneath their houses. There were wine holes made in the earth, in which they deposited their wine in vessels.

In the contest between Vitellius and Vespasian, the Capitol was again destroyed, and with it some of the most valuable records of the empire,—a loss irreparable and most unfortunate, not only to the Romans but to posterity. This occurred A.D. 69. Vespasian, when he became emperor, determined to reconstruct it, and Suetonius says that “he was the foremost to put his hand to clearing the ground of the rubbish, and removed some of it upon his own shoulder;” the same historian adds that he undertook to restore the three thousand tables of brass which had been melted in the flames, and searched in all quarters for copies of the ancient records, in which were contained the decrees of the senate almost from the building of the city; but his success seems to have been altogether incommensurate with his zeal. Another great fire happened at Rome in the second year of the reign of Titus, who immediately succeeded his father, Vespasian, on the throne. This fire consumed a large portion of the city, and among other structures the Temple of Jupiter in the Capitol, rebuilt with the utmost magnificence by Domitian, who succeeded Titus. On the gilding alone he expended 12,000 talents, above two millions and a half sterling. Immense sums had been formerly lavished on this temple. Augustus at one time placed in it 2000 pounds weight of gold, besides precious stones of immense value; and Sylla removed to it from Athens, out of the Temple of Jupiter Olympius, brazen thresholds and pillars. The roof was gilt; the interior was adorned with gilded shields, and with others of solid silver. In reference to the prodigal decorations of Domitian it was observed that he was, like Midas, desirous of turning everything into gold. It was remarked by Tacitus that its want of height detracted from the magnificence of its appearance. Statues were placed in the Capitol of each of the seven kings of Rome, to which an eighth was added in honour of Brutus, who expelled royalty. The statue of Julius Cæsar was afterwards raised near them. A hundred steps, supported by a hundred pillars, formed the ascent to this superb edifice, while, in modest contrast, stood near to it for ages the straw-roofed palace of Romulus, which still existed in the reign of Augustus Cæsar, for it is mentioned by Vitruvius, who lived at that period. Of all this

gorgeous magnificence nothing now remains but the solid foundation, the “*Capitoli immobile Saxum*.”

Among the earliest works of Rome were the *cloaca*, or sewers, the aqueducts, and roads, all useful and solid, and which are in most countries the evidences of advanced civilisation, rather than the efforts of rising states. The Cloaca Maxima was commenced by Tarquinius Priscus, and completed by Tarquinius Superbus. It was constructed of arched galleries, carried under the city in every direction, and drained the waters from the low grounds into the Tiber. They were built with a view to perpetuity, and of a massiveness to resist all casualties; and after a lapse of three thousand years they still serve the purposes for which they were originally erected. In speaking of this gigantic undertaking, Livy remarks that “Tarquin made the great subterranean *cloaca* to carry off the filth of the city, a work so vast that even the magnificence of the present age* has not been able to equal it,” and he adds, “that Tarquin sent for artists from all parts of Etruria for this and his other public works.” Pliny, who records its repair in the reign of Augustus, says that “this greatest of all works”—*opus omnium maximum*—“continued as strong as when first built by Tarquin.”

Their convenience and strength excited the admiration of the Gothic king, Theodoric, who reigned over Italy from A.D. 493 to A.D. 526, and so impressed was he with their utility that he undertook their repair. In a letter which he wrote to his minister, Cassiodorus, he says, “the care of the Roman city is a subject to which our thoughts are ever awake. For what is there which it behoves us to provide for more worthy than the keeping of a city which it is evident contains the ornaments of our republic? Therefore let your illustrious highness know that we have appointed a notable person on account of its splendid *cloaca*, which are productive of so much astonishment to beholders, that they may well be said to surpass the wonders of other cities. There thou mayest see flowing rivers enclosed, as it were, in hollow mountains. There thou mayest see the rapid waters navigated by vessels, not without some anxiety lest they should suffer shipwreck in the precipitate torrent. Hence, O matchless Rome, it may be inferred what greatness is in thee! For what city may dare to contend with thy lofty superstructures, when even thy lowest recesses can find no parallel?” At its outlet into the Tiber, the Cloaca Maxima is said to have measured thirteen English feet in height, and as many in breadth; while the arched galleries under the city leading to it were thirty feet in height, and sixteen feet in breadth; boats and loaded carts passed through without inconvenience. How so stupendous a work could have been executed, and its cost defrayed at the early period of Tarquin,—only one hundred and fifty years from the foundation of the city,—has surprised historians and embarrassed statesmen. England, now in the plenitude of power, abounding in wealth, and excelling all nations in mechanical aptitude and engineering resources, is unable or unwilling to execute what Rome accomplished in its infancy; either her rulers are less wise than the Tarquins, or her workmen less skilful than the Etruscans; and, to the disgrace of our boasted civilisation, we are compelled to enlarge and multiply our cemeteries because we refuse to construct a sufficient *cloaca*.

During the first four centuries and a half after the building of Rome, the Tiber and the natural springs supplied the inhabitants of Rome with water. In the year of the city 441, Appius Claudius Cæcus, being censor, constructed the first aqueduct, which conveyed a stream of water from a distance of eleven miles, its course being chiefly underground. Thirty years afterwards the spoils of Pyrrhus defrayed the cost of another structure of the same kind, bringing the water of the river Anio from the neighbourhood of Tivoli. Quintus Martius Rex, being censor, a hundred and twenty-five years before Christ, built another aqueduct, called from his name the Martian. To this were added subsequently two channels, the Aqua Tepula and the Aqua Julia. This last was supplied by Agrippa in the reign of Augustus, and that emperor conveyed another stream from Alizium for the use of the Neumachia, or show of naval combats. Caligula commenced one, which his successor Claudius completed. Claudius, we are told by Suetonius, “brought to the city the cool and plentiful springs of the Claudian waters, one of which is called Cæruleus, and the other Curtius and Albidinus, as likewise the river of the New Anio, in a stone canal, and distributed them into many magnificent reservoirs. The canal from the Fucine Lake was undertaken as much for the sake of profit as for

* Livy flourished in the reign of Augustus.

the honour of the enterprise; for there were parties who offered to drain it at their own expense, on condition of their having a grant of the land laid dry. With great difficulty he completed a canal, three miles in length, partly by cutting through, and partly by tunnelling a mountain,—thirty thousand men being constantly employed in the work for eleven years.* The Claudian was the most perfect of all the Roman aqueducts. One of its two rivulets, whose course was forty miles, was carried on arches for three miles, and the other for twelve miles; then they passed underground, but when they had approached within six miles of the city, the two streams united, and, for the rest of the way, were again carried upon arches. In the time of the republic, these works were placed under the superintendence of the *ædiles* and *censors*; but Augustus, impressed with their utility and importance, appointed special officers, styled *curatores aquarum*, who were responsible for their management, and Claudius placed at their orders seven hundred workmen to attend to needful repairs. Under the Emperor Nerva, the architect Frontinus was appointed as managing director of all the aqueducts, and compared with them he pronounced the Pyramids as idle structures—*pyramidas otiosas*; he enumerates nine, but later authors raise the number to fifteen and even twenty. They were ruined in the sixth century. Frontinus says that under the Emperor Nerva, nine of the aqueducts emptied their waters into the city through 13,594 pipes, each pipe of one inch diameter; and Vignere states that in every twenty-four hours Rome received no less than 500,000 hogsheads of water by means of her aqueducts. On these structures Pliny remarks, "If we consider the quantities of water brought into the city for the use of the public, for baths, for fish-ponds, for private houses, for artificial lakes, for gardens in the neighbourhood of the city, for villas; if we look at the works which have been constructed for forming a regular channel for the waters—arches raised up, mountains pierced with tunnels, and valleys filled up to a level, it must be acknowledged that there is nothing in the world more wonderful."

The munificence of the Roman emperors extended the blessing of pure and abundant water to the provinces. Athens was indebted to the Emperor Hadrian for a superb aqueduct; and the aqueduct of Segovia, in Spain, was built by Trajan, and it is said to be the best preserved of all the Roman works. There still remain one hundred and fifty-nine arcades, wholly consisting of stones, commonly large, and joined without mortar. These arcades, with the edifice, are 102 feet high; there are two ranges of arcades, one above the other. There is also an aqueduct at Metz, which crosses the Moselle, there a very broad stream, which furnished water for a naval fight. We may here, by way of comparison, mention the aqueduct which Louis XIV. built near Maintenon, in France, for carrying the river Eure to Versailles, which was 7000 fathoms in length, above 2560 feet in height, and had two hundred and forty-two arcades.*

Rome was indebted for her first highroads to the same Appius Claudius who built the first aqueduct. In the Roman Forum, near the Temple of Saturn, Augustus raised a column, called the *Milliarium Aureum*, or Golden Milestone, on which were inscribed the distances to the great cities of Italy. From this central terminus, or point of departure, the roads were carried in straight lines, in defiance of all obstructions, either by hewing through the solid rock, or raising them on arches. They were not paved, but flagged; the vast blocks of two, three, and even five feet square not being shaped, but fitted to each other in their original form. Speaking of the intercommunication between the different parts of the immense empire, Gibbon says, "All these cities were connected with each other and with the capital by the public highways, which, issuing from the Forum of Rome, traversed Italy, pervaded the provinces, and were terminated only by the frontiers of the empire. If we carefully trace the distance from the wall of Antoninus to Rome, and from thence to Jerusalem, it will be found that the great chain of communication from the north-west to the south-east point of the empire, was drawn out to the length of four thousand and eighty Roman miles. The public roads were accurately divided by mile-stones, and ran in a direct line from one city to another, with very little respect for the obstacles either of nature or landed property. Mountains were perforated, and bold arched thrown over the broadest and most rapid streams. The middle part of the road was raised into a terrace, which commanded the adjacent country, consisted of several strata of sand, gravel, and cement, and was

paved with large stones, or, in some places, near the capital, with granite. Such was the solid construction of the Roman highways, whose firmness has not entirely yielded to the efforts of fifteen centuries. They united the subjects of the most distant provinces by an easy and familiar intercourse; but their primary object had been to facilitate the marches of the legions, nor was any country considered as completely subdued till it had been rendered, in all its parts, pervious to the arms and authority of the conqueror. The advantage of receiving the earliest intelligence, and of conveying their orders with celerity, induced the emperors to establish throughout their extensive dominions the regular institution of posts. Houses were everywhere erected at the distance of five or six miles, each of them was constantly provided with fleet horses, and by the help of these relays, it was easy to travel a hundred miles in a day along the Roman roads." As an example of rapid travelling in the later periods of the empire, Gibbon adds in a note to the passage just quoted that, "In the time of Theodosius, Cæsarius, a magistrate of high rank, went post from Antioch to Constantinople. He began his journey at night, was in Cappadocia (165 miles from Antioch) the ensuing evening, and arrived at Constantinople the sixth day about noon. The whole distance was 725 Roman, or 665 English miles."

Associated with the Roman roads were the Roman cemeteries. One of the laws of the Twelve Tables forbade the burning or burial of any body within the walls of the city: *Hominem mortuum in urbe ne sepelito, neve urito*. This was the general rule, and it was deviated from only to confer a special mark of honour on an individual or a family. Thus, Publicola was buried on the Palatine Hill, and his descendants enjoyed the same right, though they never exercised it. Fabricius also was buried within the walls; and it would appear that the vestal virgins who died spotless received the same honourable sepulture. Trajan was the first emperor buried within the walls. The body of Julius Cæsar was burnt, and his obsequies, described by Suetonius, were remarkable. A pile was erected in the Campus Martius, near the tomb of his daughter Julia; before the Rostra was placed a gilded tabernacle, modelled after the Temple of Venus Genetrix; within this was an ivory bed, covered with purple and cloth of gold; at the head was a trophy, with the blood-stained robe he wore when slain. Those who had filled, and at the time were filling, the highest offices in the state, carried the bier from the Rostra to the Forum. While those present were debating whether the body should be burnt in the sanctuary of the Temple of Jupiter Capitolinus, or in Pompey's Senate House, two men, with swords by their sides and spears in their hands, set fire to the bier with lighted torches: the throng around immediately heaped on it dry faggots, the tribunals and benches of the adjoining courts, and whatever else came to hand. Then the musicians and players stripped off the dresses they wore on the occasion, and threw them into the flames. The legionaries, also, of his veteran bands cast in their armour, which they had put on in honour of his funeral. The ladies threw their ornaments into the flames, and the mantles of their children; and the Jews, whose nation had received many benefits from Cæsar, testified their gratitude to his memory by congregating on the spot for many consecutive nights. The body of Augustus was carried upon the shoulders of senators to the Campus Martius, and there burnt; and the relics, gathered up by the most eminent persons of the equestrian order, barefooted, were deposited in the mausoleum which he had built for the imperial family between the Flaminian road and the Tiber. This magnificent monument was of white marble, rising in tiers to a great height, surrounded by a dome, on which stood a statue of Augustus. Marcellus was the first person whose remains were deposited in this superb structure. He was the son of Octavia, the sister of Augustus. When Virgil recited the *Æneid* before this lady and her imperial brother, and came to the words, "*Tu Marcellus eris*," she fainted; and afterwards, as a testimony of her maternal affection and of her admiration of the poet, ordered him to be paid a gratuity for every line relating to the subject, which amounted to about two thousand pounds sterling.

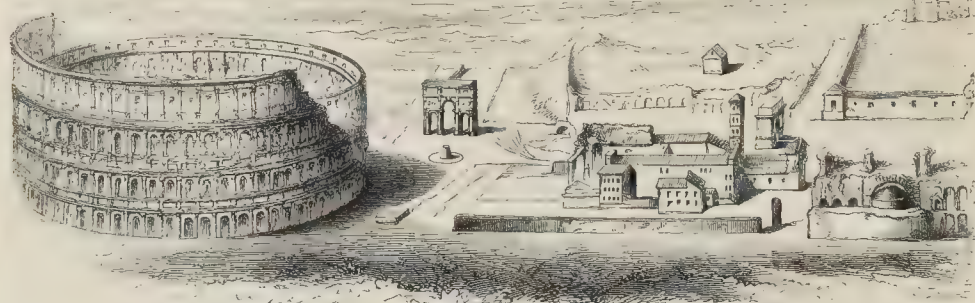
Roman sepulchres were square, circular, and pyramidal, having only one entrance. The urns and sarcophagi were placed in the vault, the statues of the dead in a chamber above, called the *parentalia*. One of the most remarkable of these monuments which has survived destruction is the tomb of Cecilia Metella, daughter of Quintus Metellus Creticus, and wife of the famous Crassus, celebrated for his wealth and avarice; and who, being defeated and made prisoner by the Parthians, was put to death by molten gold

* Encyclopædia Londinensis: Article—AQUEDUCTS.

poured down his throat. Pope Paul III. opened the tomb, when the beautiful marble sarcophagus of the deceased was discovered, and transferred to the Palazzo Farnese. This tomb was a circular edifice, so constructed as to cause an echo, and at the funeral the plaintive wailings of the mourners were heard seven or eight times in succession. Many, however, consider this statement as a poetical fiction. Another remarkable monument is the pyramidal tomb of Caius Cestius, which stood on a basis 90 feet square, and rose to the height of 120 feet. It was formed of large blocks of white marble. He lived in the age of Julius and Augustus Cæsar, and must have been extremely rich; the inscription shows that he held the priestly office, being one of the *epulones*. The priestly officers were three *flamens*, one of Jupiter, one of Mars, and one of Quirinus. There were six vestal virgins, fifteen augurs, fifteen keepers of the sacred or Sybilline books, and seven *epulones*, who prepared the tables of the gods, conducted the solemn processions, and regulated the ceremonies of the annual festivals. The college of pontiffs, or high-priests, consisted of fifteen functionaries; and there were sacred trumpeters, whose presence was necessary at every supplication and triumph. The tombs placed on the sides of the roads added magnificence and solemnity to all the approaches to the city, and whoever went from or returned to it, was reminded of his ancestors, and the patriotism of the humblest was constantly kindled by being reminded of the glories of his illustrious countrymen.

hurled into the ditch on the heads of the besiegers.* When the ditch of St. Angelo was cleared, under Urban VIII., the workmen found the Sleeping Faun of the Barberini Palace; but a leg, a thigh, and the right arm, had been broken from the beautiful statue. The best description of the Moles Hadriani is in Procopius. This faun is attributed to Praxiteles.

As the object of the Crystal Palace is to instruct as well as to amuse, it may be permitted, in a work of this description, to compare the mausoleums of Augustus and Hadrian with other monuments of a similar character. The word *mausoleum* is derived from Mausolus, a king of Caria, to whom his widow Artemisia erected a monument, ranked among the seven wonders of the world. The dimensions, as given by Pliny, were sixty-three feet in length, somewhat less in breadth, and in height about forty; its whole circumference about four hundred and eleven feet, and it was surrounded by thirty-six columns. On the mausoleum rose a pyramid of the same elevation as the mausoleum itself. It was built by four different architects. Scopas erected the side which faced the east, Timotheus built the south, Leocarches the west, and Bruxis the north. Pithis raised the pyramid; and the top was adorned by a *quadriga*, or chariot drawn by four horses. All these monuments, however, are by some considered to have been surpassed by the Taj-Mahal of Agra—erected by the Emperor Jehanger over his wife, “the light of the harem”—built of the purest white marble, and inlaid with the richest mosaic.



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The mausoleum of Augustus, to which we have alluded, was raised on lofty arches of white stone, and at the entrance of the vault were two Egyptian obelisks; it was surrounded by beautiful groves, intersected by walks, and a hanging garden, planted with evergreen shrubs.* The Emperor Hadrian determined to surpass this magnificent structure, and built the Moles Hadriani, on a quadrangular platform of solid stone. It was a lofty circular edifice, surrounded by twenty-four pillars of white marble tinged with purple; the inner wall was decorated with Ionic pilasters, and a cone of brass surmounted a majestic dome. Four statues occupied the four corners of the platform, and twenty-four adorned the portico. The whole fabric was cased with marble; and it was one of the most magnificent ornaments of antiquity. During the Gothic war, this mausoleum, now called the Castle of St. Angelo, was turned into a fortress by the celebrated Belisarius. “He drew a chain across the Tiber, the arches of the aqueducts were made impervious, and the Mole or Sepulchre of Hadrian was converted, for the first time, to the uses of a citadel. That venerable structure, which contained the ashes of the Antonines, was a circular turret rising from a quadrangular basis; it was covered with the white marble of Paros, and decorated with the statues of gods and heroes; and the lovers of the arts must read with a sigh that the works of Praxiteles, or Lysippus, were torn from their lofty pedestals, and

We now pass to the theatres. While the republic existed in its simple or severe austerity, the only places in which public games were performed were the circuses, which were dedicated to the gods; but in the year of Rome 389, stage plays were first introduced in temporary theatres, to deter the thoughts of the people from a pestilence. The actors, as well as the early architects and masons, came from Etruria, but they do not deserve to be classed higher than pantomimists; for they are described as “dancing gracefully in the Etruscan manner.” The first theatres were indeed mere movable erections, tents or booths, frequently covered in with boughs of trees; but even before they became fixed and solid structures, they were truly magnificent, and constructed in a style that fills us with admiration. Two instances may be mentioned, as noticed by Pliny. M. Scæurus, when ædile, built a temporary theatre, adorned with three hundred and sixty columns of marble and three thousand bronze statues, which he had taken from the temples of Sicily. It contained eighty thousand spectators. The lower range of pillars were thirty-eight feet in the shaft, and such was their weight, that Scæurus was obliged to give security for the reparation of the cloaca, if damaged by their conveyance. The other was semicircular, and held two distinct audiences for plays at the same time. “It was a wooden edifice,” says Eustace, “erected by Curio, for the celebration of funeral games in honour of his father; and was so contrived as

* See description in the 5th book of Strabo.

* Gibbon.



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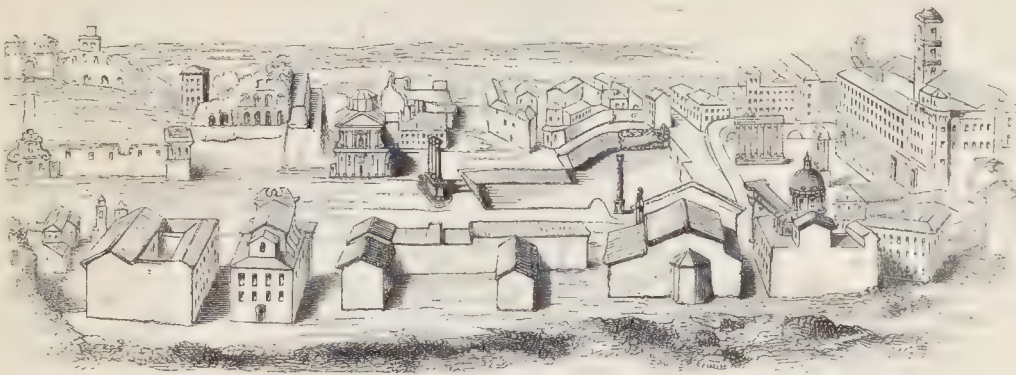


to form, according to the nature of the exhibition, either a theatre or an amphitheatre. In the morning the semicircles were placed back to back, so that the declamations, music, and plaudits of the one did not reach the other; in the afternoon they were rolled round face to face, and the circle was completed. It is to be observed that these changes were performed without displacing the spectators, who seem to have trusted themselves without scruple to the strength of the machinery and to the judgment of the architect."

The first permanent theatre built of solid materials was that of Pompey, which he erected in his third consulship; but, powerful as he then was, he was obliged to evade the strict law and conciliate the censor, by declaring that he only intended to convene the people to worship at the Temple of Venus Victrix, which he also raised in it. Pompey, in fact, erected a theatre and temple in the same building, and the ascent to the temple formed the steps to the theatre. Aulus Gellius states that "the unusual epithet of *Victrix*, applied to Venus, is thus explained by Varro:—'She is so called, *non quod vincere velit*, not from her wish to conquer, *sed quod vincere et vinciri velit*, but because she wishes to bind others and to be bound herself.'"

At the dedication of this theatre and temple a critical question arose on a point of grammar, which it is interesting to notice. As already stated, this event took place in Pompey's third consulship, and it was doubtful whether he might commemorate the fact by inscribing the word *tertio* or *tertium*. The words of Varro, in

a sort of drama, on the model of the Greeks, and was followed by Ennius. The style of both was rough and inharmonious. At a later period flourished in dramatic writing Nævius and Pacuvius, who are highly praised by Quintilian, and Plautus and Terence. Some have attributed to Plautus the authorship of a hundred and twenty plays; but Lucius Ælius, a man of great knowledge and learning, reduces them to twenty-five, though Plautus certainly retouched and polished many others, infused into them his peculiar style, and thus almost made them his own. He made money, but lost it by unlucky speculations; and Varro states that his *Saturnio* ("The Glutton") and his *Addictus* ("The Man Adjudged"), were written by him in a bakehouse, after his mercantile misfortunes, which seem to have happened to him in some of the provinces, for these two plays were composed after he had returned to Rome and hired himself to a baker, under whom he turned a hand-mill. Publius Terentius Afer, a native of Carthage, was a slave, belonging to the senator, Terentius Lucanus, who gave him an excellent education, and also his liberty when he arrived at manhood. He is supposed to have been drowned about the year 560. He enjoyed the friendship of Lælius and Scipio Africanus. His *Eunuchus* met with such success that it was acted twice on the same day, and, as Suetonius states, earned more money than any comedy had ever earned before. He puts the receipts at eight thousand sesterces, or £80 of our money; "besides which a certain sum accrued to the author for the title," which may mean for the purchase of the



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his *Rudiments*, are these:—"It is one thing to become *prætor quarto*, and another to become *prætor quartum*. *Quarto* marks the situation, *quartum* the time. Ennius has therefore with propriety written, '*Quintus pater quartum consul fuit*.'" Pompey hesitated which word to use, and consulted Cicero. Tero Tullius, the freed-man of Cicero, gives the following account:—"When Pompey was about to consecrate the Temple of Victory, the entrance to which was to serve as a theatre, and to enrol in it, as in the theatre, his name and titles, it was a subject of debate whether it should be written *Consul Tertio* or *Tertium*; which Pompey, with anxious inquiry, referred to the most eminently learned men of the state, when they were of different opinions, and some proposed *tertio* and others *tertium*. Pompey requested Cicero to give orders that it should be written according to his opinion; but Cicero, fearing to sit in judgment on men of approved learning, lest by censuring their opinions he might be thought to censure the men themselves, advised Pompey to use neither *tertio* or *tertium*, but to write it *tert*; so that though the word was incomplete, the fact was told, and the ambiguous usage of a word avoided."

Aulus Gellius fixed upon the year 510 from the building of the city, in the consulate of Claudius Cento, the son of Appius Cæcus and Marcus Sempronius Tuditanus, as the period when the regular, or what we call the legitimate drama, was introduced into Rome by Lucius Livius, who, being born of Greek parents, had the cognomen of Andronicus. He formed the Pæscennine verses into

copyright. Terence translated some of the plays of Menander, and adapted them to the Roman stage. He died young, in his thirty-fifth year.

The Romans had not that taste for the high class of drama which distinguished the Greeks. They preferred gorgeous processions, melodramatic displays, the combats of animals, and the feats of pugilists. The audience frequently interrupted the performance by calling for the shows of gladiators, or wild beasts, as Horace remarks—

"Media inter carmina posunt
Aut ursum aut pugiles; his nam plebecula gaudet."

Terence complains that the public attention was called away from his play, *Hecyra* ("The Mother-in-law"), at its first representation, by the rival exhibition of a rope-dancer.

Though regular theatres were not legally sanctioned during the republic, Æsopus and Roscius flourished during the prohibition; and the former appeared at the opening of Pompey's theatre, but his enfeebled powers would not allow him to go through his part. Both these actors enjoyed the friendship of Cicero, who made a famous oration in favour of the latter. In Greece actors were highly honoured, because the drama itself was highly esteemed; and in that country they were even employed in affairs of state and sent on foreign embassies. Thus, in a solemn embassy sent from Athens to Philip of Macedon, there were players, and that monarch bestowed on them particular marks of attention. Excepting Æsopus

and Roscius, Aulus Gellius says that they were held in a very low light at Rome. Æschines, the Athenian orator, was originally a player; and he did not lose caste by having followed that calling, although bitterly insulted for it by Demosthenes, who frequently called him "a low actor." Here is a specimen of that abuse in which Demosthenes indulged:—"A fellow that from the first never did anything good or worthy of a free man; a mere tragic ape, a rustic Ænomaus." Addressing Æschines, he made this coarse comparison: "You danced, I furnished the entertainment; you were an actor, I a spectator; you were hissed off, I was among the hissers." Thus Demosthenes lowered his personal dignity by vulgar and mean revilings.

The actors at Rome covered the whole head with a mask, and wore false hair behind their heads. The features on the mask were hideously enlarged and distorted; as the theatres were much larger than ours, the distance of the spectators rendered this necessary. In the comedies, when the chorus went off the stage, they were succeeded by a class of inferior actors, who diverted the audience for some time with apish postures and antic dances. They were not masked, but had their faces smeared over with soot, and dressed themselves in lamb-skins. They wore garlands of ivy, and carried baskets full of herbs and flowers in honour of Bacchus. They always acted barefooted, and were thence called *Planipes*.* The parts of women were performed by men, a custom which prevailed in the earlier periods of the English stage.

"The interior of Pompey's theatre was constructed in the following manner:—From the orchestra—in which the emperor, the consuls, and the senators sat—the *gradii*, or rows of seats, arose gradually in the same semicircular line, one above the other, to the top, but were divided by two *precinctones*; one in which the equestrian order sat, and another which was common to the plebeians, and above which there was only one circle of seats, supposed to be intended for the women. The seats from top to bottom were vertically cut by narrow staircases, and every division between them was called a *cuneus*, from its wedge-like form. A straight line divided the orchestra from the stage. The *scena*, which, unlike our scenes, was usually fixed, was magnificently adorned with all the conjoined embellishments of architecture, statuary, and painting. In front of it was the *proscenium*, where the actors appeared, which was terminated by two grand semicircular recesses on each side of the central one. In front of the *proscenium* was the *pulpitum*, where the actors performed. The *postscenium*, or covered porticoes, usually occupied by the actors when not on the stage, received the spectators when surprised by rain, during which the performances were necessarily suspended; for the ancient theatres were almost always open, and the spectators were only sheltered from the sun by a movable awning, which did not extend over the stage. Beyond the *postscenium* were beautiful walks and magnificent colonnades, adorned with statues and paintings, which formed a fashionable promenade of the Romans."†

Julius Cæsar intended to have built a theatre to have surpassed in magnificence that of Pompey, and the locality he chose was near the Tarpeian Mount, but death anticipated this project. Augustus carried the design into execution by raising the theatre of Marcellus,

so called after his nephew. It was dedicated by the slaughter of hundreds of wild beasts; this also was done to emulate the munificence of Pompey, who, on opening his theatre, slaughtered five hundred lions, and exhibited a battle between elephants and armed men.

From the theatres we pass on to the forums, or, more correctly, the *fora* of ancient Rome. These were of two kinds, and there were several of both. The *Fora Venalia* were public markets, as the *Forum Boarium*, the Cattle-market; the *Forum Piscatorium*, the Fish-market; the *Forum Olitorium*, the Herb-market. The *Fora Civilia* were used for the transaction of national affairs, and the investigation and decision of lawsuits. Of these republican Rome had but one, and there stood the *Rostra*, from which the orators harangued; and there were held the *comitia*, or assemblies of the people. This forum was the scene of the *curia*, or senate-house, and of the *basilica*, or courts of justice. This imposing and splendid locality was bordered with the temples of religion, lined with the statues of the most illustrious men, and terminated by triumphal arches. Each succeeding age added to its magnificence; and it was the heart and centre of the empire, the seat of piety and patriotism, of wisdom and power. It stood between the Palatine and Capitoline Hills; and here the "*religio loci*," the awe-inspiring influence of locality, prompted some of the noblest addresses which

were ever offered to the gods, or ever awakened the impulses of nationality. Here Manlius appealed to the Capitol, saved by his valour, before he was hurled from the Tarpeian Rock. Here Caius Gracchus asked if he could find a sanctuary on pavement still reeking with his brother's blood. Here Scipio, repelling the foul charges brought against him, invited the people to accompany him to the Temple of Jupiter, and thank the gods for his defeat of Hannibal. Here Virginus immolated his daughter, to save her from a tyrant's lust; and here Curtius leaped into the yawning abyss. Here were deposited the spoils which the Horatii won from the Curiatii; here

stood the Rostral Column, so called from the beaks of ships, which commemorated the naval triumph of the Consul Duilius over the Carthaginians, the first victory the Romans gained at sea; and here were erected the statue of Horatius Cocles and the equestrian statue of Clelia;—

"And in yon field below
A thousand years of silenced factions sleep.
The Forum, where the immortal accents glow,
And still the eloquent air breathes—burns with Cicero."

In the course of time the original Forum proved insufficient for the multiplied transactions of business, and the various wants of an increasing population. The length commonly assigned to it was from 600 to 650 feet, the breadth varying from 110 to 180. Vitruvius, however, says it was oblong, being one third longer than it was broad. Julius Cæsar, when a candidate for his second consulship, endeavoured to win public favour by various acts of liberality, among which he determined to build a second forum for civil purposes. The first could not be enlarged without clearing away time-hallowed edifices, by which it was closely surrounded; and this demolition would have rudely shocked popular prejudices. We learn from Suetonius that the bare site on which Julius erected his new forum cost him the enormous sum of more than a hundred million of sesterces, or about £800,000 of our money. It stood near the old Forum, behind the Temple of Romulus and Remus, and was one of



FIG. 11. THE FORUM.

* Kennet's Antiquities.

† Rome in the Nineteenth Century. Constable. 4th Edition, 1826.







the *fora civilia*, being strictly applied to lawsuits and business. Cæsar built this forum when he constructed the Temple of Venus Genitrix, he pretending to trace his descent on the paternal side



VENVS GENITRIX.

from Venus. "During his questorship," says Suetonius, "he pronounced funeral orations from the rostra, according to custom, in praise of his aunt Julia, and his wife Cornelia. In the panegyric on his aunt, he gives the following account of his own and his father's genealogy on both sides:—"My aunt Julia derived her descent, by the mother, from a race of kings, and by her father, from the immortal gods. For the *Marci Reges*, her brother's family, deduce their pedigree from Ancus Marcius; and the Julii, her father's, from Venus, of which stock we are a branch. We therefore unite in our descent the sacred majesty of kings, the chiefest among men, and the divine majesty of gods, to whom kings are subject." Before this temple of Venus Genitrix, which Cæsar dedicated to that goddess as his ancestress, he placed a statue of his famous horse, of which Suetonius gives the following curious account:—"He rode a very remarkable horse, with feet almost like those of a man, the hoofs being divided in such a manner as to have some resemblance to toes. This horse he had bred himself; and the soothsayers having interpreted these circumstances into an omen that its owner would be master of the world, he brought him up with particular care, and broke him in himself, as the horse would suffer no one else to mount him. A statue of this horse was afterwards erected by Cæsar's order before the Temple of Venus Genitrix."

Augustus Cæsar followed the example of his uncle, and built a third forum, in which he dedicated a temple to Mars Ultor, the Avenging Mars, in fulfilment of a vow he had made at the battle of Philippi. In this forum he decreed that the judges should be chosen by lot. The design of the Temple of Mars was to commemorate his triumph over Brutus and Cassius, and the other conspirators who had murdered Julius; and to do honour to his memory, Augustus commanded that the senate should always assemble there when they met to deliberate on wars and triumphs; that thence should be dispatched all those who were sent into the provinces in the command of armies; and that in it those who returned victorious from the wars should lodge the trophies of their success. Augustus constructed, or persuaded his friends to construct, a very large number of the most splendid edifices. On a single occasion he deposited in the cell of the Temple of Jupiter Capitolinus sixteen

thousand pounds weight of gold, with jewels and plate valued at fifty millions of sesterces, or £400,000; and when he consecrated the Temple of the Palatine Apollo, he melted down all the silver statues which had been erected in his honour, and converted the whole into tripods. To this temple he added porticoes, and a library of Latin and Greek authors. Some idea may be formed of its magnificence, by stating that the portico was surrounded by the statues of the fifty daughters of Danaus, and opposite to them were their husbands on horseback. Here the *Carmen Seculare* of Horace was recited. Within our space it is impossible to mention the various improvements and additions which this emperor effected in Rome. Suetonius says that he boasted of having "found it of brick, but left it of marble." His forum was surrounded by semicircular walls, to which were attached porticoes, containing the statues of all the Latin and Roman kings, and of the heroes and dictators of the republic, beginning with Æneas and ending with himself.

The career of this fortunate usurper is too remarkable to be dismissed without some allusion to his personal history. As his uncle Julius pretended to trace his family to Venus, so Augustus claimed to be the son of Apollo. His mother Atia had attended a religious solemnity in honour of Apollo at midnight; when the rest of the matrons had returned home, she fell asleep in the temple, when a serpent immediately crept to her, and soon afterwards withdrew.

When she awoke there appeared imprinted on her person the mark of a serpent, which was never effaced; and, in consequence of which, she never frequented the public baths. Atia dreamed, before her delivery, that her bowels stretched to the stars, and expanded through the whole circuit of heaven and earth. His father, Octavius, also dreamed that a sunbeam issued from his wife's womb.*

In ancient times serpentine paternities were deemed highly honourable. The following story is related by Aulus Gellius:—"The mother of Scipio Africanus was for a long time supposed to be barren; sleeping alone in her own apartment, an immense serpent was seen to repose near her, but a great noise being made by those who

saw it, the reptile glided away, and could not be found. This was related by her husband, Publius Scipio, to the augurs, who, after performing sacrifice, replied that he would have children. Not many days after the appearance of this serpent, the woman began to feel the usual symptoms of conception. In the tenth month she brought forth, and that Publius Scipio Africanus was born who conquered Hannibal, the Carthaginian, in Africa, in the second Punic war. It is not impertinent to add," continues Gellius, "that the writers whom I have mentioned (C. Oppius and Julius Hyginus) have recorded that this Scipio Africanus did very frequently, at the latter part of the night, before break of day, go to the Capitol, and command the Chapel of Jove (the interior or more sacred part, the *cella*) to be opened; and that he would there remain a long time alone, as if consulting with Jupiter concerning the republic. The porters of the temple were greatly astonished that on his coming to the Capitol alone, and at that time, the dogs, who were always furious to other people, neither molested him nor barked at him."

Alexander the Great also wished it to be believed that he was the son of Jupiter Ammon, who had visited his mother in the form of a serpent. He addressed a letter to her in these words:—"King Alexander, son of Jupiter Ammon, sends health to his mother

* These circumstances are narrated by Suetonius; and he adds many other marvels on the birth and childhood of Augustus.



INTERIOR VIEW OF THE FORUM.

Olympias." She wittily answered, "I beseech you, my son, be at peace; do not summon me to a court of judicature, nor accuse me before Juno; for she will surely inflict on me a grievous punishment, when she finds it confessed in your letters that I am her husband's mistress."

Augustus Caesar was a despot. He has been extravagantly praised because he succeeded. Had he failed in his attempt to enslave his country, he would have been as much execrated as Catiline. He patronised literature, and enriched poets, who paid him back in the most fulsome adulation; and Horace, anticipating his apotheosis, styled him a god while he was a living mortal—"Præens Augustus Divus habebitur;" and in another passage he writes, "*Jurandasque tuum per nomen ponimus aras.*" A regular custom was introduced, that on the decease of any emperor who had neither lived nor died like a tyrant, the senate, by a solemn decree, should include him in the number of the gods; and the ceremonies of his apotheosis were blended with those of his funeral. But idolatry does not hallow a tyrant, and the richest gilding does not conceal the hideousness of arbitrary power. Suetonius strongly insinuates that Augustus caused the assassination of Hirtius and Pansa, that he might have the armies under his own control; and quotes Aquilius Niger, who avers that he killed Hirtius with his own hands. He leads the reader to believe that Glyco, the surgeon, caused the death of Pansa by poisoning his wound, at the instigation of Augustus. Of his cruelty he leaves no doubt. An illustrious senator prayed that he might not be left unburied after being put to death, and the answer was, "That will be in the power of the birds." "Two others, father and son, who begged for their lives, he ordered to cast lots which of them should live, or settle it between themselves by the sword, and was a spectator of both their deaths; for the father offering his life to save his son, and being accordingly executed, the son likewise killed himself on the spot." As he was one day making an harangue, he observed Pinarius, a Roman knight, taking notes of his speech, and ordered him on the spot to be stabbed as a spy. Quintus Gallius, the prætor, went to compliment him with a double tablet under his cloak: the tyrant, evidently conscious of his own guilt, suspected the tablet was a sword, and in his terror and rage ordered Gallius to be put to death, and, with his own hands, plucked out his eyes. He dragged the two sons of Mark Antony and Fulvia from the statue of Julius Caesar, to which they clung praying for life, and murdered them, as he did Cæsario, the son of Cleopatra and Julius; and in that spirit of meanness, which delights to kick the dead lion, he sent the head of Brutus to be cast at the feet of Caesar's statue, though he imbrued his hands in the blood of Cæsar's child. Let not then the love of art screen this fortunate usurper from the execration due to crime.

Of his boasted family and serpentarian descent a few words may be added. Mark Antony says that his great grandfather, on the paternal side, was a freedman of the territory of Thurium, and by trade a ropemaker; while his grandfather was a usurer. On the mother's side, his defeated rival avers that his great grandfather was of African descent; and at one time kept a perfumer's shop, and at another a bakehouse, in Aricia. And Cassius of Parma, in a letter, taxes Augustus with being the son not only of a baker, but of a usurious baker. These are his words:—"Thou art a lump of thy mother's meal, which a money-changer of Nerulum, taking from the newest bakehouse of Aricia, kneaded into some shape, with his hands all discoloured by the fingering of money."* It is a vulgar prejudice which praises or blames a man for his origin, for which he is not responsible; the architect of his own greatness, not the possessor of transmitted honours, stands before the world truly eminent, and the humbler his birth, the higher his merit; there is a starting point in the longest genealogy, and that point is obscurity. Julius and Augustus are not remembered because they feigned to be sprung from Venus and Apollo, but because the victories at Pharsalia and Actium made them masters of the world.

Other forums were built by succeeding emperors, both as ornaments to the city and as necessary additions to those already existing, when new facilities for the transaction of business were required. The forum, which bore the name of the Emperor Nerva, was commenced by Domitian, continued by Nerva, and finished by Trajan, who placed in it a temple, which he dedicated to Nerva, for all the Cæsars became gods after death. In allusion to this practice of

deification, Vespasian, when he was sick, used humorously to say that "He felt himself beginning to become a god."

The Forum of Trajan was built by Apollodorus, a celebrated Greek architect, whom Hadrian put to death for an adverse criticism on his Temple of Venus at Rome. Here stood the famous triumphal Column of Trajan,* and the valuable library called the Bibliotheca Ulpia, which was afterwards removed to the baths of Diocletian. This forum contained the admired equestrian statue of Trajan. When Constantius visited Rome, Hormisdas, a fugitive prince of Persia, who accompanied the emperor, knowing that his imperial master wished to remove the equestrian statue to Constantinople, observed, "before he had such a horse, he must build such a stable,"† meaning Trajan's Forum. The Column of Trajan was formed of thirty-eight blocks of white marble; and its height of one hundred and ten feet denoted the elevation of the hill that had been cut away. On it were sculptured two thousand five hundred human figures, each on an average two feet high. It described the Dacian wars of the emperor; and was a complete representation of the standards, military costume, evolutions, and warlike paraphernalia of the Romans. In the precincts of the Forum of Trajan were certain statues gilt on every side, representing horses and trophies, and under them was written "*ex manubiis.*" This expression had a doubtful meaning even in the time of Aulus Gellius, who narrates a conversation that took place on the true interpretation of the words. One of those present said that *ex manubiis* meant *ex prædâ*, and that the *manubie* were the spoils, *que manu sunt capta*, which are taken by the hand. But *præda*, plunder, means one thing, as we learn from old writers, and *manubie* another; for *præda* means the substance itself of the thing taken, and *manubie* is the money collected by the questor from the sale of the plunder. "Therefore," said Favorinus, "this inscription which you are examining, *ex manubiis*, demonstrates not the spoils themselves, for none of those things were taken by Trajan from his enemies, but shows that these ornaments were fabricated and provided from the *manubie* or money arising from the sale of the spoils." It may here be observed that, in the time of the republic, *manubie* was used to signify that portion of the spoils assigned to the commander-in-chief of a victorious army, which he applied to the service of the state, or to religious uses; in this manner the earlier public edifices were constructed, for it is plain that no private fortunes could have defrayed the cost.

The Ulpian Library of Trajan, the library which Augustus attached to the Temple of the Palatine Apollo, and others, are sufficient proofs that the emperors were not afraid of the diffusion of knowledge. Libraries, indeed, were very common among the ancients. Pisistratus, the tyrant, is said to have been the first who collected books of the liberal sciences at Athens for public use. Afterwards the Athenians themselves, with great care and pains, increased the number; but all this collection of books, Xerxes, when he took possession of Athens, and burned the whole city, except the citadel, seized and carried away to Persia; but King Seleucus, who was called Nicanor, many years afterwards sent them back to Athens. A prodigious number of books were, in succeeding times, collected by the Ptolemies in Egypt, to the amount of nearly seven hundred thousand volumes; but in the first Alexandrine war the whole library, during the plunder of the city, was destroyed by fire, not by any concerted design, but accidentally, by the auxiliary soldiers.

In Greece were several famous libraries. Clearchus, who was a follower of Plato, founded a magnificent one in Heraclea. There was one in the island of Cnidos. The books of Athens were removed by Sylla to Rome. The public libraries of the Romans were filled with books, not of miscellaneous literature, but were rather political and sacred collections, consisting of what regarded their laws and the ceremonies of religion. The Egyptian Library was begun by Ptolemy Philadelphus. It is worth relating of this prince that when the Athenians were in great distress from a famine, he refused to furnish them with provisions till they first presented him with the original works of their three celebrated tragedians. This library was accidentally burned by Cæsar's soldiers, but it was afterwards restored by Antony, who gave it to Cleopatra.‡

Among the conspicuous ornaments of Rome were arches. The Arch of Claudius Drusus Nero, erected in the Appian Way, was

* All these details we have taken from Suetonius.

* See Engraving, p. 52.

† Gibbon.

‡ Beloe's notes, in his translation of the Attic Nights of Aulus Gellius.

decreed to him for his military services. He commanded in the Rhoetan and German wars.

"Drusum gerentem bella sub Alpibus
Videre Rhoeti."

He was the first of all the Roman generals who navigated the Northern Ocean, dug some prodigious trenches beyond the Rhine, and sailed up the Meuse and the Waal. He died in Germany, not without suspicion of having been poisoned; and though the son, father, and brother of an emperor, he never rose beyond the rank of a private citizen. His mother, Livia, was married to Augustus when she was pregnant, and three months afterwards gave birth to Drusus, who was nevertheless presumed to be the son of Augustus. This Drusus was the brother of the Emperor Tiberius, and father of the Emperor Claudius and of the famous Germanicus.

The Arch of Tiberius was erected to celebrate the recovery of the standards of Varus, which Germanicus recovered. This Germanicus was the father of Caligula; he died at Antioch in the thirty-fourth year of his age, and Tiberius is suspected of having ordered him to be poisoned. "For besides the livid spots," says Suetonius, "which appeared all over his body, and a foaming at the mouth, when his body was burnt the heart was found entire among the bones; its nature being such, as it is supposed, that when tainted by poison it is indestructible by fire." This was a vulgar error, which passed as a current idea when Suetonius wrote, which was in the time of the Emperor Hadrian. It is recorded by Ammianus Marcellinus that Germanicus, when in Egypt, visited the consecrated bull Apis, that animal delivering oracles at Memphis; and they who consulted it judged whether the answer was favourable or unfavourable by its acceptance or refusal of food presented by the applicants. The offering of Germanicus was refused, and shortly afterwards he died. There are some other similar anecdotes about Apis, which may here be mentioned. It was consulted by Eudoxus, the famous astronomer, when a very young man; the animal licked his mantle, from which gracious reception his future fame was predicted. Alexander the Great offered homage to Apis. Augustus Cæsar went to see it, so did Vespasian; and their examples were followed by Hadrian and Septimus Severus. Titus wore a diadem at Memphis at the consecration of the ox Apis.

The Arch of Titus* was built to commemorate the joint triumph of himself and of his father Vespasian, after the capture and sack of Jerusalem. It was constructed after their deaths by the senate and people of Rome. It consisted of four stories, and was adorned with eight marble columns. The interior was decorated with two bas-reliefs, representing Titus in his triumphal car, conducted by the genius of Rome, and crowned by the hand of victory. On its walls were represented the tables of the shewbread, the seven-branched golden candlesticks, the silver trumpets, and sculptured figures of the captive Jews.

The Arch of Constantine was erected at Rome after he had vanquished Maxentius, his rival for supreme power. The arch was constructed to commemorate his triumph. Such was the decline of the arts at that period that no sculptor could be found to adorn the monument, and the Arch of Trajan† was despoiled to flatter the vanity of the conqueror. No attention was paid to the violent anachronism which confounded time and place, circumstances and characters. The Parthian captives appeared prostrate at the feet of a prince who had never crossed the Euphrates; and Constantine appropriated to himself the trophies of Trajan.

The small arch dedicated to Septimus Severus, to Julia his wife, and to their son Caracalla, was erected at the cost of the silversmiths and merchants who carried on their business in the Forum Boarium, as proved by an inscription carved on its front.

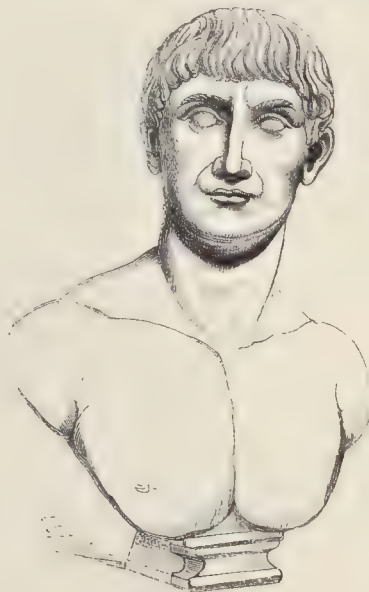
Rome was embellished by several Egyptian obelisks. Augustus placed one in the Circus Maximus. It was one hundred and sixteen feet in height, including the basis, serving as a gnomon to a large solar clock, executed by the mathematician Manilius, who added a gilt ball to the summit. In this clock the length of the days and nights was determined by means of large bronze lines enclashed in a stone stratum, which also marked the hours to the sixth hour, and the lengthening and shortening of the days.

The two obelisks that stood at the entrance of the Mausoleum of Augustus were brought to Rome by Claudius. Another stood in the gardens of Sallust, and two small ones were placed in front of

the Temple of Isis and Serapis, but it is uncertain by whom these were transported from Egypt.

That which Suetonius calls the "Great Obelisk," was conveyed to Ostia, the harbour of the Tiber, by Claudius, who sank the vessel with which it was freighted in that port to strengthen its foundations. This ship, a marvel in those days, is described by Pliny. A fir-tree of prodigious size, whose girth it required four men with extended arms to embrace, was used in the construction of this vessel. It required 120,000 bushels of lentils for its ballast; and the length of it nearly equalled all the left side of the Port of Ostia. This obelisk was placed by Caligula in the circus which he erected. It originally stood at Heliopolis, having been dedicated to the sun by Phero, son of Rameses II., the Sesotris of Herodotus, in gratitude of his recovery from blindness.

The largest of all the obelisks was transported by Constantius, and placed in the *spina* of the Circus Maximus. It had been designed by Constantine for the embellishment of Constantinople; and, as Gibbon states, after being removed by his order from the pedestal where it stood before the Temple of the Sun at Heliopolis, was floated down the Nile to Alexandria. The death of Constantine suspended the execution of his purpose, and this obelisk was



BUST OF TRAJAN.

conveyed by his son to the ancient capital of the empire. A vessel of uncommon strength and capaciousness was provided to convey this enormous weight of granite, at least one hundred and fifteen feet in length, from the banks of the Nile to those of the Tiber. The Obelisk of Constantius was landed about three miles from the city, and elevated by the efforts of art and science in the great circus of Rome.

The next subject which invites attention is the Circus Maximus. It has already been observed that theatres were not permitted in the times of the republic, and the only public games allowed were those of the circus. They are supposed to have been borrowed from the Etruscans. Romulus instituted games in honour of Neptune, which the Sabines attended; and these were celebrated on the site where the Circus Maximus was afterwards built by Tarquinius Priscus, which was afterwards enlarged by additional rows of seats. According to Catina, it stood in the valley between the Aventine and the Palatine Hills. Of this circus he gives the following account:—"It is related by Dionysius Halicarnassus that Tarquinius Priscus gave a permanent form to the circus called Maximus, in the valley situated between the Palatine and the Aventine, being the

* See Engraving, p. 56.

† See Engraving, p. 53.

first to construct covered seats around, as the people were before obliged to view the games standing on benches, supported by wooden poles; he also divided the ground into thirty districts, assigning one to each *curia*, in order that the people should be regularly placed, so as to have a distinct view of the games. This circus was subsequently formed into a structure, so large that it was considered as one of the remarkable objects of the city. The length of this circus, according to Dionysius, was three stadia and a half (the stadium an eighth of a mile), the breadth four *plectri* (400 feet), and a deep ditch, ten feet broad, surrounded the two longer and one of the lesser sides. Behind the ditch, called the *euripus*, there were three tiers of porticoes; the two larger sides, as in all the other *circi*, were united at one extremity by a smaller side, having the form of a semicircle; and the larger sides consisted of a single portico of three rows, embracing eight stadia, capable of containing 150,000 persons. On the smaller side were the starting points, where the horses were let loose at the same moment. Without the circus there was another portico of a single tier, which contained the shops, and over these there were various habitations. In each of the shops were entrances and steps, used as a passage to view the games. As to this description of Dionysius, the matters which relate to the dimensions and the number of spectators are stated differently by Pliny, and are not considered to be exact. Dionysius states that the number that could be contained within the Circus Maximus was 150,000, Pliny 260,000, Victor 380,000, the *Notitie* 485,000. The disparities must be attributed to the different additions made to the circus, principally by the emperors, as deduced from the various statements of ancient writers."

The games of the circus were dedicated to the gods; and altars and temples were appropriately built round all the *circi*. The games were various: chariot and foot races, fights of gladiators, wrestling, boxing with the cestus, leaping, and, indeed, all kinds of athletic sports.

The games were exhibited in honour of the gods, at the expense of the ædiles, many of whom were ruined. Julius Cæsar surrounded the Circus Maximus with a canal, sixteen feet in breadth, where the *Naumachia*, or naval games, were celebrated; and there Augustus exposed to the public thirty-six crocodiles, after his triumphant return from Egypt. That emperor made youths of the highest rank compete in the chariot and foot races, and in the combats with wild beasts. According to Suetonius, his favourite spectacle was the Trojan game, acted by a select number of boys, in parties differing in age and station; thinking that it was a practice both excellent in itself, and sanctioned by ancient usage, that the spirit of the young should be displayed in such exercises. To prevent confusion, Augustus assigned seats to people of different ranks. The

soldiers were separated from the people; married plebeians had their particular benches. Women were not allowed to see the combats of gladiators, except from the upper part of the theatre; and they were excluded from wrestling matches. The Emperor Claudius embellished the Circus Maximus with marble barriers and gilded goals, which before his time were of wood and stone; and he assigned distinct places to the senators, who had formerly taken their seats promiscuously with the people. He made the prætorian knights, with their tribunes, and even the præfect at the head of them, encounter wild beasts from Africa. In the reign of Nero, senators, and even aged matrons, performed parts in the games of the circus. That emperor had exhibited races in which each chariot was drawn by four camels. A distinguished Roman knight, so

Suetonius affirms, descended on the stage by a rope, mounted on an elephant. Nero drove chariots himself, competing for the prize, and sang in the theatre like an ordinary actor. "In these contests he adhered so strictly to the rules, that he never durst spit, nor wipe the sweat from his forehead in any other way than with his sleeve." The Emperor Probus caused a large number of trees to be dug up by the roots, which were transplanted into the middle of the circus. "The spacious and shady forest was immediately filled with a thousand ostriches, a thousand stags, a thousand fallow deer, and a thousand wild boars; and all this variety of game was abandoned to the riotous impetuosity of the multitude. The tragedy of the succeeding day consisted in the massacre of one hundred lions, an equal number of lionesses, two hundred leopards, and three hundred bears. The collection prepared by the younger Gordian for his triumph, and which his successor exhibited in the secular games, was less remarkable for the number than the singularity of the animals. Twenty zebras displayed their elegant forms and variegated beauty to the eyes of the Roman people. Ten elks and as many camelopards, the loftiest and most harmless creatures that wander over



TRAJAN'S COLUMN.

the plains of Sarmatia and Ethiopia, were contrasted with thirty African hyenas and ten Indian tigers, the most implacable savages of the torrid zone. The unoffending strength with which nature has endowed the greater quadrupeds was admired in the rhinoceros, the hippopotamus of the Nile, and a majestic troop of thirty two elephants. While the population gazed with stupid wonder on the splendid show, the naturalist might indeed observe the figure and properties of so many different species, transported from every part of the ancient world into the amphitheatre of Rome. But this accidental benefit which science might derive from folly, is surely insufficient to justify such a wanton abuse of the public riches. There occurs, however, a single instance in the first Punic war, in which the senate wisely connected this amusement of the multitude with

the interests of the state. A considerable number of elephants, taken in the defeat of the Carthaginian army, were driven through the circus by a few slaves, armed only with blunt javelins. The useful spectacle served to impress the Roman soldier with a just contempt for those unwieldy animals, and he no longer dreaded to encounter them in the ranks of war."⁹

In every circuit was a buried altar, dedicated to the god Consus, who is supposed to be the same as the equestrian Neptune; some consider him to have been the god of Counsels or Secrecy, who inspired Romulus with the project of carrying off the Sabine women. The altar of Consus was placed in a dark spot, covered over with earth; and was only opened when the preparatory sacrifices were to be offered, to teach the people that counsels ought to be hidden, and never divulged.

There were several smaller *circi*. That of Flaminius, who was killed at the battle of Thrasymenus; the Agonalis, where games were celebrated in honour of Janus, supposed to have been instituted by Numa; that of Flora, in which nude females competed in the

once recognised is benefactor, fawned upon him, and licked his hand. The whole audience were astonished; and Tiberius gave the slave his freedom. He afterwards exhibited the lion, led by a string, at the shows in Rome, and thus derived a comfortable subsistence. There is a similar story in the *Gesta Romanorum*, preserved by Warton, who considers it an oriental apologue on Gratitude. It is thus narrated in the *Gesta*:—"A knight in hunting meets a lion, from whose foot he extracts a thorn. Afterwards he becomes an outlaw, and, being seized by the king, is condemned by him to be thrown into a deep pit, to be devoured by a hungry lion. The lion fawns on the knight, whom it perceives to be the same that drew the thorn from its paw. 'Then,' said the king, 'I will learn forbearance from the beast. As the lion has spared your life when it was in its power to take it, I therefore grant you a free pardon. Depart; and henceforward be admonished to lead a virtuous life.'"

Similar in design to the *circi* were the amphitheatres, of which the most magnificent was the Flavian, commenced by Vespasian



THE ARCH OF TRAJAN.

race, a practice suppressed out of respect to the virtue of Cato the Censor, and where, Suetonius asserts, Galba "presented the new spectacle of elephants walking upon ropes." The Circus of Salustius may also be mentioned, and that of Nero, commenced by Caligula. There it was that Nero tortured the Christians to death, nailing them alive to crosses, exposing them to be devoured by furious dogs, or wrapping them in combustible garments, which were set fire to by torches to illuminate the darkness of night.

The Circus Maximus was the scene of the pathetic story of *Androcles and the Lion*, related by Aulus Gellius, who took the facts from Appon, an eye-witness of the scene. It occurred in the time of Tiberius. Androcles, a fugitive slave, sought refuge in a cave, into which a lion entered, holding up one of its paws, wounded by a sharp thorn. This he removed; the grateful lion brought him food daily. At length he quitted the den of the friendly beast, and, some years after their extraordinary meeting, they encountered each other in the Circus Maximus. The lion at

and finished by ritus. This structure is popularly known as the Coliseum,* frequently written Colosseum. It was built on the ground formerly occupied by the Domus Aurea, the Golden House of Nero, which Vespasian pulled down, as too vast and splendid for a mortal. This gorgeous palace of Nero extended from the Palatine to the Esquiline Hill; and we shall avail ourselves of its description by Suetonius. The porch was so high that there stood in it a colossal statue of Nero a hundred and twenty feet in height; and the space included in the builded area was so ample that it had triple porticoes a mile in length, and a lake like a sea, surrounded with buildings, which had the appearance of a city. Within its area were corn-fields, vineyards, pastures, and woods, containing vast number of animals of various kinds, both wild and tame. In other parts it was entirely overlaid with gold, and adorned with jewels and mother-of-pearl. The supper-rooms were vaulted; and compartments of the ceilings, inlaid with ivory, were made to revolve and scatter flowers, while they contained pipes which

* Gibbon.

* See Engraving, p. 55.

poured down unguents upon the guests. The chief banqueting-room was circular, and revolved perpetually, night and day, in imitation of the celestial bodies. The baths were supplied with water from the sea and the Albula. Upon the dedication of this magnificent house, after it was finished, all Nero said in approval of it was, "that he had now a dwelling fit for a man." He commenced making a pond for the reception of all the hot streams from Baiae, which he designed to have continued from Misenum to the Avernian Lake, in a conduit enclosed in galleries; and also a canal from Avernum to Ostia, that ships might pass from one to the other without a sea voyage. The length of the proposed canal was one hundred and sixty miles; and it was intended to be of breadth sufficient to permit ships with five banks of oars to pass each other. For the execution of these designs Nero ordered all prisoners, in every part of the empire, to be brought to Italy; and that even those who were convicted of the most heinous crimes, in lieu of any other sentence, should be condemned to work at them. He was encouraged to all this wild and enormous profusion, not only by the great revenue of the empire, but by the sudden hopes given him of an immense hidden treasure, which Queen Dido, upon her flight from Tyre, had brought with her to Africa. This a Roman knight pretended to assure him, upon good grounds, was still hid there in some deep caverns, and might with a little labour be recovered.

It is a vulgar regret that the palaces of England are vastly inferior to those of the ancients, and are even surpassed by those of modern sovereigns on the continent of Europe; but it should be remembered that the vigilance of representative government, and the wise jealousy of constitutional freedom, are the best securities against the wasteful expenditure of ostentatious pride. That country is to be envied where the homes of the millions are decent and comfortable, for these attest the equality of a modest competency; and it is on the distribution, not on the concentration of wealth, that national happiness depends. We admire the Romans for constructing their useful aqueducts, conducting as they did to the benefit of all, but the palaces of the Caesars were merely monuments of selfishness, tyranny, and withering taxation. We have seen by whose labour the Golden House of Nero was constructed; and we know that the building of St. Peter's, at Rome, in a great part defrayed by the sale of indulgences, led to the Reformation, and the bloody wars and persecutions which ensued; nor has any philosophic historian denied that one of the remote provocatives to the French Revolution, whose volcanic heavings have not yet subsided, was the colossal and gorgeous fabric of Versailles. Let us then in England be warned not to peril our political institutions by an insane indulgence in Titanic architecture; and let us cease to envy those people who boast of palaces erected by the extortions of despotism.

Having noticed the Golden House of Nero, it may be interesting, before we describe the Flavian Amphitheatre, reared by the captive Jews whom Vespasian and Titus carried to Rome, to refer to the Palace of Diocletian, at Salona. It covered an extent of ground consisting of between nine and ten acres. The form was quadrangular, flanked with sixteen towers. Two of the sides were near six hundred, and the two others near seven hundred feet in length. The whole was constructed of a beautiful freestone, extracted from the neighbouring quarries of Trau, or Tragutium, and very little inferior to marble itself. Four streets, intercepting each other at right angles, divided the several parts of this great edifice, and the approach to the principal apartment was from a very stately entrance, which is still denominated the Golden Gate. The approach was terminated by a peristylum of granite columns, on one side of which we discover the square Temple of Æsculapius, and on the other the octagon Temple of Jupiter. The range of principal apartments was protected towards the south-west by a portico 517 feet long. This was built in the decline of the empire, and but a few years before the government was transferred to Byzantium by Constantine—a striking proof that palatial architecture is no evidence of the strength or stability of kingdoms.

The Flavian Amphitheatre is thus described by Gibbon:—"It was a building of an elliptic figure, 564 feet in length, and 467 in breadth, founded on fourscore arches, and rising with four successive orders of architecture to the height of 140 feet. The outside of the edifice was encrusted with marble, and decorated with statues. The slopes of the vast concave which formed the inside were filled and surrounded with sixty or eighty rows of seats of marble, covered with cushions, and capable of receiving with ease above fourscore thousands of spectators. Sixty-four *comitories*

(for by that name the doors were very aptly designated) poured forth the immense multitude; and the entrances, passages, and staircases, were contrived with such exquisite skill, that each person, whether of the senatorial, the equestrian, or the plebeian order, arrived at his destined place without trouble or confusion. Nothing was omitted which in any respect could be subservient to the convenience or pleasure of the spectators. They were protected from the sun and rain by an ample canopy, occasionally drawn over their heads. The air was continually refreshed by the playing of fountains, and profusely impregnated by the grateful smell of aromatics. In the centre of the edifice, the *arena*, or stage, was strewn with the finest sand, and successively assumed the most different forms. At one moment it seemed to rise out of the earth like the garden of the Hesperides, and was afterwards broken into the rocks and caverns of Thrace. The subterranean pipes conveyed an inexhaustible supply of water, and what had just before appeared a level plain might be suddenly converted into a wide lake, covered with armed vessels, and replenished with the monsters of the deep. In the decoration of these scenes the Roman emperors displayed their wealth and liberality; and we read on various occasions that the whole foundation of the amphitheatre consisted either of silver, or of gold, or of amber. The poet who describes the games of Carinus, in the character of a shepherd, attracted to the capital by the fame of their magnificence, affirms that the nets designed as a defence against the wild beasts were of gold wire; that the porticoes were gilded, and the belt or circle, which divided the several ranks of spectators from each other, was studded with a precious Mosaic of beautiful stones."

In the amphitheatre were exhibited many of the games which before its erection had been celebrated in the Circus Maximus. When Titus dedicated this building, he exhibited a naval fight and a combat of gladiators; and in one day, as Suetonius attests, brought into it five thousand wild beasts of all kinds. We learn from Pliny, that gladiators were first publicly exhibited at Rome by two brothers called Bruti, at the funeral of their father, in the year of the city 490, and for some time these combats were confined to such occasions; but they were highly popular with the Romans, and the magistrates introduced them at the Saturnalia and the festivals of Minerva. The life of a defeated gladiator depended on a cruel and capricious audience; and if they turned down the thumb, the unfortunate victim was butchered on the spot. When Constantine embraced Christianity, this barbarous sport, as it was called, was prohibited; but it continued, in defiance of authority, till the reign of Honorius, when Telemachus, an Asiatic monk, rushed into the arena to separate the combatants. The infuriated multitude crushed him to death with stones; but his martyrdom put an end to the festivities of murder. It is well observed by Gibbon, "that no church has been raised, nor shrine dedicated, to the only martyr who died in the cause of humanity."

The amusements of the circus and the amphitheatre, sometimes innocent, too frequently barbarous, strangely though strongly illustrate the feelings and inner life of the people; and when they tamely submitted to tyrants, they deemed themselves amply compensated by bread and the Circensian games. The first exhibition of wild beasts took place in the year of Rome 502, when one hundred and forty-two elephants taken in Sicily were produced. In 661, Sylla displayed one hundred lions. When Pompey opened his theatre, he exhibited seventeen elephants, six hundred lions, which were killed in the course of five days, and four hundred and ten panthers. Mark Antony is said to have yoked to his carriage four rhinoceroses, which had been tamed. Julius Caesar produced the first camelopard. The keeping and feeding these beasts was a heavy expense; and Suetonius avers that, "when flesh was only to be had at a high price, for feeding his wild beasts reserved for the spectacles, Caligula ordered that criminals should be given to them to be devoured." Commodus, another imperial monster, appeared to think that skill in archery was the highest accomplishment of a sovereign. This diademed ruffian had been told that Hercules had immortalised himself by slaying the Nemean lion and the wild boar of Erymanthus; and Commodus aspired to emulate that hero, not by attacking wild beasts in their native forests, but in an arena, where he was safe from danger. But it must be confessed that he became a proficient in the use of his weapon. "Whether he aimed at the head or the heart, the wound was alike certain and mortal. With arrows, whose point was shaped into the form of a crescent, Commodus intercepted the

rapid career, and cut asunder the long bony neck of the ostrich. A panther was let loose, and the archer waited till he had leaped upon a trembling malefactor: in the same instant the shaft flew, the beast dropped dead, and the man remained unhurt. The dens of the amphitheatre disgorged at once a hundred lions; a hundred darts from the unerring hand of Commodus laid them dead as they ran raging round the arena. Neither the huge bulk of the elephant, nor the scaly hide of the rhinoceros, could defend them from his stroke. Ethiopia and India yielded their most extraordinary productions, and several animals were slain in the amphitheatre, which had been seen only in the representations of art, or perhaps of fancy. In all the exhibitions, the securest precautions were used to protect the person of the Roman Hercules from the desperate spring of any savage beast which might possibly disregard the dignity of the emperor and the sanctity of the god.* Commodus even entered the lists as a gladiator; but out of tender regard to his own person, and to prevent the contingency of a wound or loss of life, his antagonists were only allowed the use of leaden weapons. As a gladiator he fought no less than one hundred and thirty-five times. It may here be added, that Commodus was not the only emperor who spent much of his time in acquiring perfection in the vulgar science of archery. He had a rival in the Emperor Domitian. "Many persons," says Suetonius, "have seen him often kill a hundred wild animals, of various kinds, at his Alban retreat, and fix his arrows in their heads with such dexterity, that he could in two shots plant them like a pair of horns in each. He would sometimes direct his arrows against the hand of a boy standing at a distance, and expanded as a mark, with such precision, that they all passed between the boy's fingers without hurting him."

The scenic decorations of modern theatres are frequently beautiful and wonderful, but they are tame when compared with the exhibitions of the Roman stage. When Titus dedicated the Flavian Amphitheatre, he not only exhibited five thousand wild beasts, as already mentioned, but astonished the spectators by a faithful representation of the rocks and forests in which they were born and roved. Occasionally the whole arena suddenly disappeared, and from the chasm sprung up dense woods and abrupt precipices, over which the beasts bounded and roared; and condemned malefactors, lifted up from the abyss, were quickly thrown down to be devoured by the savage brutes for the gratification of an equally brutal audience. But there was excessive luxury at these spectacles. Showers of perfumes were not only diffused over all the seats, but poured down the steps of the theatre, through pipes which led from the centre of the arena to the summit of the amphitheatre. This took place at the celebration of games by Hadrian in honour of Titus.

Among the most splendid and colossal structures of Rome were the *Thermae*, or Baths. The gigantic aqueducts, already described, furnished an ample and unfailing supply of water. It was under Augustus that these establishments assumed an appearance of vastness and grandeur, that emperor having been cured of a disease of the liver by his physician, Antonius Musa, who recommended cold bathing when warm had failed.† Pliny reckons eight hun-

dred *thermae*. To these edifices gymnasia and libraries were attached, where men of learning used to read their works to their friends. Suetonius says that Augustus composed almost entirely a book of epigrams while in the bath. The *thermae* were decorated with pillars, statues, and paintings.

The most splendid baths bear the names of Titus, Domitian, Caracalla, and Diocletian. "The baths of Antoninus Caracalla, which were open at stated hours for the indiscriminate service of the senators and the people, contained about sixteen hundred seats of marble, and more than three thousand were reckoned in the halls of Diocletian. The walls of the lofty apartments were covered with curious mosaics, that imitated the art of the pencil in the elegance of design and the variety of colours. The Egyptian granite was beautifully encrusted with the precious green marble of Numidia; the perpetual stream of hot water was poured into the capacious basins through so many wide mouths of bright and massive silver; and the meanest Roman could purchase with a small copper coin the daily enjoyment of a scene of pomp and luxury which might excite the envy of the kings of Asia. From these stately palaces issued a swarm of dirty and ragged plebeians,

without shoes and without a mantle, who loitered away whole days in the streets or forum, to hear news and hold disputes; who dissipated in extravagant gaming the miserable pittance of their wives and daughters, and spent the hours of the night in obscure taverns and brothels, in the indulgence of gross and vulgar sensuality."* The money paid for admission was the quarter of an *as*, which was equivalent to about half a farthing. The length of the Baths of Caracalla was 1840 feet, its breadth 1476; and at each end was a temple—one dedicated to Apollo, the other to *Æsculapius*, as the tutelary gods of an edifice consecrated to the improvement of the mind and the health of the body. In the centre was a swimming school. An *odeum*, or musical theatre, was attached, and outside the edifice were walks shaded with trees. In the ruins of these baths were found the *Flora*, the *Callypigiæ Venus*, the *Farnesæ Hercules*, and the *Toro Farnesæ*.

The Baths of Titus were inferior in size to those of Caracalla, but surpassed them in the beauty of decoration, as the arts had sensibly declined in the reign of Caracalla. The Baths of Titus contained seven halls or vaulted rooms, each one hundred feet in length by fifteen in breadth and twenty in height. These contained the reservoirs to supply the baths, and occasionally the Flavian Amphitheatre with water for the naval engagements. It was in the ruins of these *thermae* that the statue of the *Laocoon* was discovered, in the popedom of Leo X.; and Pliny states that it stood there in his time. Here also were paintings of the *Faun*, the *Nymph*, the *Bacchante*, the *Mercury*, and the *Loves and Graces* which Raphael studied. Here also was found the "*Nozze Aldobrandini*," so called from the *Aldobrandini Gallery*, to which it belonged. It is supposed to represent the marriage of *Peleus* and *Thetis*. The study of this painting is said to have formed the taste of Poussin.

Temples were numerous in Rome, and the Pantheon, built by Agrippa, now a Christian church, is one of the most remarkable;



FLAVIAN AMPHITHEATRE

* Gibbon.

† Suetonius, in vitâ Augusti. Sect. lxxxi.

* Gibbon.

but before it was despoiled it must have been most magnificent. The title of this building would imply that it was dedicated to all the gods;* but the express words of Pliny invalidate that conclu-



FARNESSE HERCULES.

sion, for he states that it was dedicated to Jove the Avenger: "*Pantheon Jovi Ultori ab Agrippa factum.*" It was adorned with the spoils of Egypt gathered after the battle of Actium, and among the statues was a Venus adorned with earrings made of a split pearl, the twin-sister of that which Cleopatra dissolved and drank at her banquet with Mark Antony. It was valued at £80,729 of our money. For such an act alone this woman deserved dethronement.

Vespasian's Temple of Peace was erected A.D. 71, on the conclusion of his wars with the Germans and Jews, and was the largest in Rome. In it he and his son Titus deposited the holy instruments of the Jewish religion—the gold table and the gold candlestick with seven branches. At the end of four centuries they were seized by Genseric, the Vandal, when he sacked Rome, and by him transferred to Carthage. When Belisarius conquered Africa, the vessels of the Jewish temple were recovered, and deposited by the Emperor Justinian in the Christian church of Jerusalem. The Temple of Peace stood near the Roman Forum.

A Temple to Piety was erected in the Forum Olitorium by Aclius Glabrio, the Duumvir, to commemorate the victory of his father over Antiochus, at Thermopylae, and a gold statue of Glabrio was placed in it. Another temple of the same name was built by order of the Roman senate, in honour of the Roman daughter who saved the life of her father, condemned to perish by hunger, by nurturing him from her bosom. This occurred in the prisons of the Decemviri, which stood in the ancient Forum Olitorium; they were destroyed, and this temple was erected on their site. Pliny states that the daughter suckled her mother, instead of her father. The Roman may, in tradition, have been confounded with the Grecian daughter, who also saved her father's life in the same manner.

The Temple of Venus Erycina stood in the circus and gardens of Sallust, and to this the Roman women went annually in procession,

* Dio says that the Pantheon of Agrippa had its name because, from the roundness of its figure (*θολοειδὲς οὖν*), it resembles heaven, the abode of the gods.

bearing gifts and offering supplications. It was in this temple that many suppose Julius Caesar formed a cabinet of natural history.

The Septizonium of Severus was a remarkable edifice, built in the form of a pyramid, and consisted of seven porticoes or temples, supported by pillars of the finest marbles, rising above one another, and towering to a great elevation. It survived the incursions and plunder of the barbarians, but was despoiled by Pope Sixtus V. A further account of the antiquities of Rome, and of their conversion and spoliation, will be more appropriately considered when we treat of the Renaissance and Italian Courts; but we cannot dismiss our present subject without some general remarks on the wealth of the Romans, and on the internal causes of the ruin of the empire.

The sums expended by the Romans in architecture must have been prodigious; but their vast wealth was not derived from commerce, but from conquest, and the tributes they imposed on the vanquished. From the conquest of Syracuse and Carthage, Macedonia and Asia, they acquired enormous riches; and the treasures of Perseus alone amounted to two millions sterling. After the subjugation of that prince, the people were relieved from taxes, and the superfluous mass of gold and silver was deposited in the Temple of Saturn, which contained the public treasury. Augustus kept a regular balance-sheet of income and expenditure, which he bequeathed to the senate, but it has not come down to posterity.

It is, however, known from other sources that the tributes of Asia, levied after the conquests of Pompey, yielded four millions and a half of our money. The revenue of Egypt was two millions and a half under the last of the Ptolemies, and at a later date largely increased. Gaul is presumed to have contributed as much as Egypt. After the destruction of Carthage, immense sums were drawn from Africa; and under Nero, six Romans were ascertained to have been in possession of half of the land of that country; and it was discovered in his reign that Marullus Epirus and Crispus Vibius had each acquired two millions and a half. Spain was a mine of wealth. "Mention is made of a mine near Carthage, which yielded every day twenty-five thousand drachms of silver, or about three hundred thousand pounds a year. Twenty thousand pounds weight of gold was annually received from the provinces of Asturia, Galicia, and Lusitania." Gibbon, who quotes this yield from Spain on the authority of Strabo and Pliny, comes to the conclusion that the general revenue of the Roman provinces could seldom amount to less than fifteen or twenty millions of our money, which was ample for the moderate government instituted by Augustus. However, this emperor revived taxation, imposing excise, and an assessment on real and personal property.

The accumulation of colossal fortunes by plunder, subsequently augmented by the most extortionate usury, commenced with the usurpation of Sylla, under whom Crassus realised five millions sterling. Lentulus, the augur, was worth upwards of three millions. Claudius Isodorus, although he had lost a great part of his fortune in the civil war, left by his will 4116 slaves, 3600 yoke of oxen, 267,000 of other cattle, and in ready money nearly half a million. Augustus received by the testaments of his friends more than thirty-two millions. The debts of Milo amounted to upwards of £560,000. Julius Cæsar, before he enjoyed any office, owed a quarter of a million. When he set out to take the command of Spain, he



ARCH OF TITUS.

says himself that he was two millions worse than nothing. Crassus once bailed him to the extent of £871,500. At the beginning of the civil war he purchased the friendship of Curio by a bribe of £480,000, and of the Consul Plancus with £280,000. Antony, on the ides of March, when Cæsar was killed, owed £320,000, which he paid before the kalends of April; and squandered of the public money £5,650,000. Apicius wasted on luxurious living £484,000; and being at length obliged to investigate his affairs, found that on payment of his debts there only remained to him £80,000; considering this sum a close approximation to beggary, he ended his days by poison. Pliny says that in his time Lollia Paulina wore, in full dress, jewels to the value of £32,000, *quadrigies sestertium*; or, as others read the passage, *quadringentis sestertium*, the jewels must have been worth ten times that amount, or £320,000. Julius Cæsar presented Servilia, the mother of Brutus, with a pearl worth £48,000. Caligula laid out on a supper £80,000; and the ordinary expense of Lucullus for a supper in the Hall of Apollo was £1600, and that too when he only entertained two guests. The fishpond of C. Herius was sold for £32,000; and the fish of Lucullus for the same sum. The villa of M. Scaurus being burnt by the malice of his slaves, he estimated his loss at £800,000.*

Pompey distributed between three and four millions among his troops; and it was ascertained, in the reign of Augustus, that four hundred slaves were contained in a single palace. The same number of four hundred belonged to an estate which an African widow, of a very private condition, resigned to her son, while she reserved to herself a much larger share of the property.

This excessive wealth in the hands of a few accounts for the architectural embellishments of Rome. We have already shown the nature of the *manubie*, and how the general appropriated the proceeds during the republic. When the empire was established, wealth concentrated itself in the hands of the Cæsars and their favourites. Augustus, for instance, built the portico and basilica of Lucius and Caius, the porticoes of Livia and Octavia, and the Theatre of Marcellus. His friends emulated his example: thus Marcus Philippus raised the Temple of Hercules and the Muses; Lucius Cornificus, the Temple of Diana; Asinius Pollio, the Court of Freedom; Munatius Plancus, a temple to Saturn; Cornelius Balbus, a theatre; Statilius Taurus, an amphitheatre; Marcus Agrippa, the noble portico of the Pantheon, if not the Pantheon itself, and more than one hundred fountains, ornamented with marble columns and statues. No modern fortunes could meet such expenditure, even if modern were equal to Roman patriotism; for he who now builds a small church, or

adorns one with a painted window, is lauded as a most munificent patron.

At a later period, in the reigns of Nerva and Hadrian, flourished the illustrious family of Herod, whose wealth and liberality ought not here to be passed over unnoticed. The younger Herod resided at Athens, where, at his own cost, he built a stadium entirely of white marble, six hundred feet in height, capable of admitting the whole body of the people, and finished in four years, while Herod was president of the Athenian games. To the memory of his wife, Regilla, he dedicated a theatre, scarcely to be paralleled in the empire; no wood except cedar, very curiously carved, was employed in any part of the building. The Odeum designed by Pericles for musical performances and the rehearsal of new tragedies had been a trophy of the victory of the arts over barbaric greatness, as the timbers employed in the construction consisted chiefly of the masts

of the Persian vessels. Notwithstanding the repairs bestowed on that ancient edifice by a king of Cappadocia, it had again fallen into decay. Herod restored its ancient beauty and magnificence. Nor was the liberality of that illustrious citizen confined to the walls of Athens. The most splendid ornaments bestowed on the Temple of Neptune in the isthmus, a theatre at Corinth, a stadium at Delphi, a bath at Thermopylæ, and an aqueduct at Canusium, in Italy, were insufficient to exhaust his treasures. The people of Epirus, Thessaly, Eubœa, Bœtia, and Peloponnesus, experienced his favours; and many inscriptions of the cities of Greece and Asia gratefully style Herodes Atticus their patron and benefactor.*

While external splendour gratified the pride of the degenerate Romans, and the games of the circus and the amphitheatre deluded them into a forgetfulness of their ancient freedom, the cankerworm was gnawing at the vitals of the empire. "During the entire ages of Trajan and the Antonines, a succession of virtuous and philosophic emperors followed each other; the world was at peace; the laws were wise and well

administered; riches seemed to increase; each succeeding generation raised palaces more splendid, monuments and public edifices more sumptuous than the preceding; the senatorial families found their revenues increase; the treasury levied greater imposts. But it is not on the mass of wealth, it is on its distribution, that the prosperity of states depends; increasing opulence continued to meet the eye, but man became more miserable; the rural population, formerly active, robust, and energetic, were succeeded by a foreign race, while the inhabitants of towns sank in vice and idleness, and perished in want amidst the riches they had themselves created."†

This internal decay of Rome may be referred to three principal causes: excessive usury, the concentration of large landed estates



LAOCOON.

* These estimates are taken from Adam's Roman Antiquities, who cites authorities in each case, and gives in pounds, shillings, and pence, what we have expressed in round numbers.

* Gibbon.

† Sismondi. Italian Republics.

in few hands, and the existence of the Prætorian Guards, who put up the empire to auction.

By the laws of the Twelve Tables, the interest of money was limited to one per cent. As population multiplied itself, and mercantile transactions were increased, the supply of legal tender money bearing no proportionate augmentation, legal interest rose to twelve per cent. towards the end of the republic, and under the first emperors; but this limitation was eluded by the arts and unprincipled extortion of usurers. It was quickly doubled; and, in Cicero's oration against Verres, it is put down at 48 per cent., while Horace mentions a case when 60 per cent. was exacted. This indeed was the rate received by Marcus Brutus, when proconsul of Sicily. Such a system could not be otherwise than fatal to productive industry; and it caused, in a great degree, those results which Sismondi has described. The immense wealth accumulated by Claudius Isodorus, to whose case we have referred, was the effect of usury, as Pliny expressly affirms—"Fenus hoc fecit, et nummus percussus." Usury did this, and coined money. Lucan points out



COLOSSAL STATUE OF ANTIQUS.

the same evil as the precursor of the civil war, which he commemorates in the *Pharsalia*.—

"Hinc, usura vorax, rapidumque in tempora fenus,
Hinc, concussa fides, et multis utile bellum."

The accumulation of colossal fortunes by usury was accompanied by what Pliny calls *latifundia*, or large farms, which he declares proved the ruin of Italian agriculture. In the early times of the republic no citizen had more ground than he could cultivate with his own hands. Romulus allotted to each only two acres; and after the expulsion of the kings, the limit did not exceed seven, which continued for a long time to be the usual portion assigned to even the most illustrious of the Romans,—for Cincinnatus, Curius Dentatus, Fabricius, and Regulus, had no more. But when cupidity and the love of ostentation had expelled those primitive virtues which were the real foundations of Roman greatness, pride and avarice disdained these small allotments. Nor were men satisfied with one estate, even of large dimensions; they required many, scattered over various parts of the country. Pliny himself had four villas, and his mother-in-law as many. Cicero had at least six; and as none of these were numbered among the most opulent of their time, it is evident that persons of large fortune possessed a greater number. Immense usurpations of land took place during the civil wars; and we may judge of their extent by the single fact of

Augustus having given the whole territory of Cremona, and no small portion of the neighbouring districts, to his veterans. Antonius, Cicero's colleague, besides his estates in Italy, was proprietor of the whole island of Cephallonia, and erected in it a new city at his own expense. In the time of Nero it was ascertained that six Romans were in possession of one half of Africa. The celebrated Tiburtine villa of Hadrian, with its appurtenances, occupied a space seven miles in circumference. It was in the ruins of this villa that the statue of Antinous, the favourite of Hadrian, and most remarkable for his beauty, was discovered. He was drowned while bathing in the Nile, in A.D. 122.

Probus, the chief of the Anician family, held immense estates, which were scattered over the wide extent of the Roman world. The marbles of the Anician Palace were used as a proverbial expression of opulence and grandeur; and the nobles and senators of Rome aspired, in due gradation, to imitate that illustrious family. The accurate description of the city, which was composed in the Theodosian age, enumerates one thousand seven hundred and eighty houses, the residence of wealthy and honourable citizens. Many of these stately mansions might almost excuse the exaggeration of the poet—that Rome contained a multitude of palaces, and that each palace was equal to a city, since it included within its own precincts everything which could be subservient either to use or luxury—markets, hippodromes, temples, fountains, baths, porticoes, shady groves, and artificial aviaries. The historian Olympiodorus, after



BUST OF ANTIQUS.

describing the state of Rome when it was besieged by the Goths, continues to observe that several of the richest senators received from their estates an annual income of four thousand pounds of gold, above £160,000 sterling, without computing the stated provision of corn and wine, which, had they been sold, might have equalled in value one third of the money. Compared to this immoderate wealth, an ordinary revenue of a thousand or fifteen hundred pounds of gold might be considered as no more than adequate to the dignity of the senatorian rank, which required many expenses of a public and ostentatious kind. Several examples are recorded in the age of Honorius of vain and popular nobles who celebrated the year of their prætorship by a festival which lasted seven days, and cost above £100,000 sterling. The estates of the Roman senators, which so far exceeded the proportion of modern wealth, were not confined to the limits of Italy. Their possessions extended far beyond the Ionian and Ægean seas, to the most distant provinces; the city of Nicopolis, which Augustus had founded as an eternal monument of the Actian victory, was the property of the devout Paula; and it is observed by Seneca, that the rivers which had divided hostile nations now flowed through the lands of private citizens.*

Even in the time of Augustus the rural population showed

* Gibbon.

evident symptoms of decay, and concubinage was encouraged to arrest the depopulation of the country. Pertinax granted an immunity from taxes to those who would occupy the desert lands of Italy, to the cultivators of the distant provinces, and the allied kings. Aurelian did the same. Probus was obliged to transport from Germany men and oxen to cultivate Gaul. Maximian and Constantius transported the Franks and Germans from Picardy and Hainault into Italy; but the depopulation in the towns and country still continued. The people surrendered themselves in the fields to despair, as beasts of burthen. The arable land was turned into pasture. In districts where so many and industrious citizens were to be seen in former times, alike ready to defend or cultivate their small estates, slaves only were to be found. Large tracts were devoted to hunting which had once been subjected to the plough. Rome depended for its subsistence on the harvests which its fleets brought from Sicily, Africa, and Egypt. It became impossible to recruit the legions with native Romans; and even in the time of Marcus Aurelius, when he waged war against the Quadi and Marcomanni, that emperor was obliged to strengthen his armies with slaves and robbers. Thus men decayed as wealth accumulated, and the empire fell when the rapacity of the privileged classes had reduced the once free citizens to beggary and bondage.

The establishment of the Pretorian Guard, instituted to defend despotism, finally reduced the emperors to a state of military vassalage. This force was first enrolled by Augustus to maintain his usurped dominions; but that dextrous tyrant, fearing to alarm the people, only kept three cohorts in Rome, quartering the others in the neighbouring towns, so as to be readily summoned in the event of any disturbance. These troops had double pay and exclusive indulgences; their number appears originally to have varied from nine to ten thousand, but at a later period, under Vitellius, it rose to sixteen thousand. Augustus, in his long reign, had habituated the Romans to servitude; and his successor, Tiberius, emboldened by their growing degeneracy and baseness, assembled the whole body of the pretorians in the capital, and assigned them a permanent and fortified camp. From reign to reign their pride and insolence increased. At length they murdered the Emperor Pertinax, appeared on the ramparts of the camp, and, with a loud voice, proclaimed that the Roman world was to be disposed of to the best bidder at public auction. They had already received bribes in the name of donations. The first who descended to this mean and impolitic method of corruption was the Emperor Claudius, who gave them £120 per man. Hadrian complained that the promotion of a Cæsar had cost him two millions and a half sterling. Marcus Antoninus, with his colleague, Lucius Verus, paid the pretorians £160 per man. On the murder of Pertinax, Didius Julianus purchased the throne by a payment of £200 sterling per soldier; while Septimus Severus promised the Pannonian army, which he commanded at the death of Pertinax, £400 each after he had acquired the empire.

Usury, the monopoly of land, and military despotism, appear then to have been the three principal causes of the internal decay of Rome. Ruined within, it became powerless to resist attacks from without, and fell before the successive invasions of the Goths, Huns, Vandals, and other barbarians. In what order these irruptions destroyed the monuments, and other causes which subverted the edifices and temples, will be more appropriately narrated in the section of this work which is devoted to the Renaissance and Italian Courts; which will also contain an account of the architectural and artistic restoration of New Rome under the reign of the Popes.

This historical retrospect of kingly, republican, and imperial Rome, is of course not addressed to that happily diminishing class who regard the Crystal Palace as merely a gilded toyshop, where they can feast the eye with novelty, and enjoy the sensations of a lively but fugitive excitement. The Crystal Palace is a temple of knowledge and a school of study; and its monuments are the exponents of the inner life of the people by whom they were constructed. There is no greater proof of vulgar ignorance, than admiration of products and indifference to producers; while it is an equally assured mark of intelligence when men begin to inquire what circumstances created peculiar styles of architecture, or gave rise to peculiar forms of sculpture,—for this involves the motives of the artificers, and the mind of the investigator is elevated from insentient matter to sentient man. Religion is the real founder of

architecture, sculpture, and painting; the styles vary because the religions vary, and those variations are the result of education, or of feelings modified by education. The Greeks excelled all other nations in every department of art, because they excelled them all in the culture of the intellect; and, as Mr. Owen Jones has remarked, "conceiving God in the image of man, they made men like gods." Mr. Jones continues thus:—"Greek art under the Romans became still more material, and lost the refinement which had redeemed it with the Greeks. Having attained an almost boundless power over the earth, the Romans set themselves up as gods, and neglected the traditional duties of their forefathers. The real religion of the Romans, or bond of union, which held all men moving sympathetically round one centre, was glory, conquest, luxury; hence the monuments which the Romans have handed down to us as the true chronicles of their times, are the Coliseum, the baths, the theatres, and the triumphal arches; these only can lay claim to any originality of invention." If then the claims of the Romans to originality are so limited, in what light are we to consider the long list of objects which in the Crystal Palace are associated with the Roman Court? They were not sculptors. We have seen that they were indebted to the Etruscans for their earliest monuments. At a later period, while they were conquering Greece, they plundered that country of its statues to embellish their own capital; and, after the conquest, resident Greeks devoted their chisels to the services of their new masters. Rome not only contained the Egyptian obelisks which we have described, but in the reign of the Emperor Hadrian many statues were formed in imitation of those of Egypt, to decorate the *canopus* in his magnificent villa at Tivoli; but Winckelman has pointed out that these copies may be easily recognised, because they are not covered with hieroglyphics. The Roman Court, therefore, contains no works of art wrought by Roman hands.

The Roman Court externally to the nave presents three arches of the Tuscan order, which is the earliest style of columnar architecture found in Italy. This façade is taken from the lowest range of columns on the outside of the Coliseum, at Rome, which we have engraved under the more appropriate title of the Flavian Amphitheatre. This is a faithful representation, as the original building still exists, though in a mutilated form; but the Model of the Forum of Rome,* which we have also engraved, is but a reproduction, since the ancient Forum has long ceased to exist, and the pictorial restoration is not be deemed exact, but only an approximation to accuracy.

One of the finest pieces of sculpture in the Roman Court is that called the Toro Farnese, describing the story of Dirce tied to a bull, but deriving its modern name from the circumstance of its having formerly been placed in the Farnese collection. It was discovered in the baths of Caracalla, and is the work of two sculptors of Rhodes, Apollonius and Tauriscus, and carved out of one block of marble. The legend is that Lycus, king of Thebes, having divorced his wife Antiope, espoused Dirce, who persecuted Antiope. Amphion and Zethus, sons of Antiope by Jupiter, in vengeance tied Dirce to a bull, which dragged her about till she perished. The infliction of this punishment is vigorously described: the bull manifests impatience of restraint, while the prostrate victim implores mercy in vain. The countenances of the sons are marked by strong expression, while their attitudes are full of vigour and grace. The account in Pausanias is more copious. Amphion and Zethus collected an army, invaded Thebes, vanquished Lycus in battle, and took possession of his kingdom; and joining the lower city with Cadmea, called the whole country Thebes, on account of their alliance with the nymph Thebe, the daughter of Prometheus. Dirce honoured Bacchus above all the divinities; and when she suffered that dire punishment from Amphion and Zethus, Bacchus was indignant with Antiope, and afflicted her with madness. From this malady she was freed by Phocus, the grandson of Sisyphus, who married her.

We have engraved the Laocoon of the Vatican,† though the specimen in the Roman Court, taken from the gallery of the Duke d'Arenberg, at Brussels, only represents the head of the father. Laocoon, a Trojan, urged the people not to admit the Grecian horse within the walls of the city. Minerva dispatched two serpents through the sea, which, on reaching the shore, entwined themselves round the bodies of Laocoon and his sons, and crushed

* See Engraving, pp. 46, 47.

† See Engraving, p. 57.

them to death in the coil of their folds. This group was found in the ruins of the palace of Titus, during the reign of Leo X., where Pliny says it stood in his time. It was discovered by Felici de Fradis, celebrated in a Latin poem by Sadoletto. It has been remarked as a curious fact that in the Laocoon, as in the Apollo Belvedere, the feet are of unequal length, purposely so executed to aid the perspective. We learn from Pliny that the figure of Laocoon himself was the work of Agesander the Rhodian, and that his reputed sons, Athenodorus and Polidorus, carved the children. In the time of Pliny the whole group was considered to be formed of a single block (*ex uno lapide eum et liberos*), but it is now known that the children were executed separately, and afterwards joined to the principal figure. A more dreadful tragedy was never sculptured. The blood curdles when the mind realises the facts. Horror presides over a scene of torturing death from which escape is hopeless. Physical and moral agony are depicted in the countenance of the father, who appears conscious of his inability to rescue his boys who cling to him for succour. The horrible reptiles are breaking every bone.

"The distorted face," says an eloquent writer, "the rolling eye, the ghastly features, the bristling hair, the racked and working muscles, the starting sinews and distended limbs of Laocoon, give us the picture of human nature in its last stage of horror and suffering." To the unspeakable sublimity of the figure of Laocoon himself every tongue pays homage; in its perfection keen-eyed criticism has never espied a fault; but it is generally and truly said that the children are not formed like nature. The poetical description in the *Æneid*, and the execution of the statue, are such perfect counterparts of each other, that it would appear almost certain that either the poet copied the sculptor, or the sculptor realised the conception of the poet.

The Apollo Belvedere is believed by the learned Visconti to be the Apollo Alexicacos, or Deliverer from Evil, the work of the Greek sculptor Calamis. Pausanias, however, says that Calamis "painted an Apollo whom they call Alexicacos;" and adds, that "this name was given to the god because, as the Delphic oracle proclaimed would be the case, he caused a pestilence to cease which raged in the time of the Peloponnesian war."* The learned Mr. Taylor, in a note on this passage, says, "Apollo Alexicacos, or the Dispenser of Evil, through the divinity Pæan, whom he contains in his essence, as is evident from the following lines in the beautiful hymn of Proclus to the sun:—

"From thy bland dance, repelling deadly ill,
Salubrious Pæan blossoms into light,
Health far diffusing, and th' extended world
With streams of harmony innoxious fills."

The Apollo Belvedere was found near Antium, in the ruins of a Roman villa, supposed to have originally belonged to Nero. Winckelmann ascribed it to the age of Alexander the Great; but later critics affirm that it is made of Italian, not of Greek marble, and variously refer it to the age of Nero or the age of Hadrian. Under this view it is presumed to be a copy from some great work of the Alexandrian epoch,—probably a bronze statue, an opinion founded on the peculiarly thin folds of the *chlamys*. It is called Belvedere because it is placed in the Belvedere of the Vatican. The expression of the countenance of this statue is one of intellectual power, and a calm consciousness that the power is

irresistible. The dilated nostril and curved lip indicate disdain, and a transient indignation. The fatal arrow, carrying death to the Pythian serpent, has just darted from the bow of Apollo. Vigour appears in every muscle, but there is no indication of the rudeness of mere physical force characteristic of a Hercules. In the Apollo all is grace and elegance, and criticism has pronounced this statue faultless. It has been suggested that Milton had this divine form in view in his description of Adam:—

"His fair large front, and eye sublime, declared
Absolute rule; and hyacinthine locks
Round from his parted forehead manly hung
Clustering, but not beneath his shoulders broad."

The head of Olympian Jupiter, placed in the Vatican, was found at Otriculum, during the excavations carried on by Pius VI. It is considered the finest and largest head of this divinity that is known, and is supposed to be a copy from Phidias.* It is of Italian marble. We learn from Pausanias that the Elians dedicated a temple to Jupiter Olympius, in which his statue was consecrated. The name

of the sculptor was carved at the foot of the god: "Phidias the Athenian, the son of Charmidas, made me." "The temple," writes Pausanias, "is built after the Doric manner, and the inclosure is a circle of pillars. It is built, too, of *parus*, a stone which that country produces. With respect to its altitude, from the bottom area to the eagles which sustain the roof there is a distance of sixty-eight feet; its breadth is ninety-five feet, and its length two hundred and thirty. The god sits on a throne of ivory and gold, and is adorned with a crown on his head, made in imitation of a branch of the wild olive-tree. In his right hand he holds a victory, which is also made of ivory and gold. His left hand wields a sceptre of beautiful workmanship, in the composition of which all metals are blended together. The bird which sits on his sceptre is an eagle. The sandals of the god and his robes are of gold; and in the latter of these various animals, and of flowers the lily, are represented. The throne itself is variegated with gold and precious stones, with ebony and ivory; and is adorned with the pictures of animals, and with statues."† With all these splendid accessories, it is easy to believe

that Phidias would bestow all his art on the head of the statue. Mr. Scharf well observes, "Benignity, serenity, power, and majesty, seem all united in this magnificent head. What then must have been the glory of the entire statue, of which this only formed a part?" A description of the temple will find a more appropriate place in the section of this work which will describe the Greek Court.

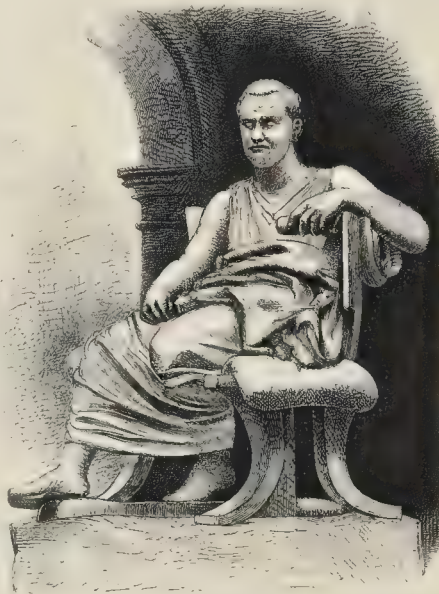
The *Ægina* marbles, purchased by the king of Bavaria, and now in the Glyptothek, at Munich, were discovered in 1811 by Mr. Cockerell, the eminent architect, and three other gentlemen. They were disjointed fragments, which the celebrated sculptor, Thorwaldsen, restored at Rome. They are supposed to have belonged to the Temple of Jupiter Panellenius, erected by *Æacus*, as mentioned by Pausanias,‡ out of gratitude to that god, who caused rain to fall in Greece, after a long drought, at the prayer of *Æacus*, who was selected by the Delphic oracle to offer up supplication to Jupiter. A copy of these marbles is placed at the extreme north end of the nave in the Crystal Palace, but it must be remembered that they are

* Numbered 337 in Roman Court Catalogue.

† Pausanias. Prior Eliacs, c. x. and xi.

‡ Corinthiacs, c. xxix.

* Pausanias. Attics, chap. iii.



MENANDER.

but parts of a whole, and can only be fairly criticised in that light. The fragment that has been preserved represents the combat for the body of Patroclus, slain at the siege of Troy by Hector. "In point of art the Ægina school stands between the Etruscan and Grecian schools. The Ægina and Etruscan marbles resemble each other in the style of the drapery and the treatment of the hair. The Ægina marbles are remarkable for varied display of the human figure and strong muscular delineation, anatomical precision and close imitation of life in the attitudes."^{*}

We have given two engravings of Antinous,[†] the favourite of the Emperor Hadrian, the one larger than life, the other a bust. In the former he holds a caduceus, from which circumstance he is supposed to appear as the representative of Mercury. The arrangement of the hair is peculiar. In the bust the expression of the countenance is sad, and the eyes and face are downcast. The Antinous was discovered in the ruins of Hadrian's villa.

The Meleager of the Vatican (No. 293 in the Catalogue) is a very spirited figure, discovered in the sixteenth century. This hero of antiquity is celebrated for killing the boar of Calydon, which had long devastated the country. The statue originally held a spear. At its right side is a dog, at the left a boar's head. Pausanias says that the spear of Meleager was dedicated in the Temple of Apollo, and that the pipes of Marsyas were also placed there;[‡] and that Polygnatus painted his picture "in the building beyond the fountain Cassotis, in Phocæa, which the Delphians called Lesché, because men used formerly to discuss serious and trifling affairs in it. Homer, in the abusive speech of Melanthis to Ulysses, evinces that there were many such places in every part of Greece:—

"Hence to the Lesché, from the midnight air,
Or some black forge, the vagrant's haunt, repair."

It was in the building referred to that Polygnatus executed his great historical work, called the *Subversion of Troy*, in which the artist places the figure of Meleager above that of Oilean Ajax, at whom he is gazing. This picture, fully described by Pausanias, is also mentioned in one of the elegies of Simonides:—

"The artist Polygnatus, for his sire
Who claims Aglaophon, in Thesus born,
Painted the captured town of Troy."[§]

The two grand colossal groups of a young man and a horse, known as the Castor and Pollux of Monte Cavallo, were discovered

in the ruins of the baths of Constantine. The names of Phidias and Praxiteles are inscribed on these statues, but this is not conclusive evidence of genuineness, as the trick of counterfeiting such inscriptions has been long since detected; as, for instance, in the case of the Venus de Medicis, which is marked with the name of Cleomenes. Some antiquarians have insisted on identifying these statues with Alexander and Bucephalus. Flaxman considers them the work of Phidias and Praxiteles, because in the frieze of the Parthenon there is a young hero governing a horse, which bears a strong resemblance to those groups; but the anonymous author whom we have quoted, in noticing the Ægina marbles, observes that "any one who has studied the undoubted works of Phidias in the Elgin marbles, or felt the beauties of the masterpieces of Praxiteles, even in the ancient copies, will not subscribe to this opinion. No original work of Praxiteles, if we except that of Monte Cavallo, is extant; but the ancient copies of his 'Cupid bending the Bow,' his 'Faun,' and a few more, enable us to conceive their wonderful perfection."

We engrave the sitting figure of the Greek comic poet Menander,^{*} discovered in a circular hall on the Viminal Hill at Rome, supposed to have belonged to the baths of Olympias. There is great firmness and decision of character in the eyes and mouth. The face is beardless. The left hand rests on the back of the chair. The dress is skilfully disposed. Pausanias states that "in the theatre of Athens there are many images of obscure tragic and comic poets, for except Menander there is not any celebrated comic poet."[†] It is supposed that the statue now in the Vatican may have originally been placed in this theatre. Pausanias farther observes that Menander, the son of Diophanes, was buried (where are the tombs of the most noted men) on the line where Themistocles built the walls after the expulsion of the Medes, and which were thrown down during the dominion of the Thirty Tyrants.

It would be easy to enlarge this list, but the specimens given are sufficient to illustrate the sculpture of the Roman Court; and we shall return to this branch of our subject when we treat of the Greek Court, for it is inconvenient, if not unwise, to separate statues from the temples in which they were originally consecrated; for however ably a critic may estimate the merits of a figure standing by itself, full justice is not done to the conceptions of the sculptor unless the figure is surrounded by all its accessories, whether historical, mythological, or poetic. For this reason we desire to postpone further remarks till we have the opportunity of describing the religious edifices of Greece, and of commenting on the paintings, architecture, and sculpture of her highly-gifted sons, and on the spirit which animated them in executing their marvellous productions.

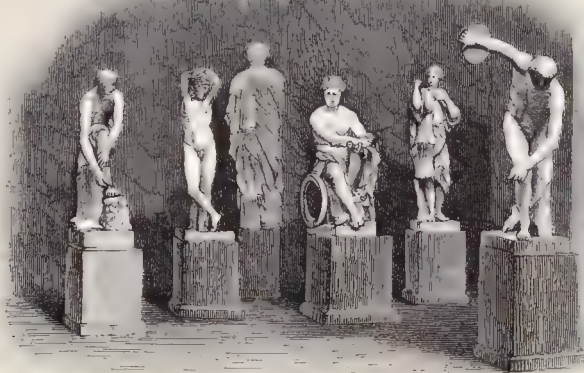
* See Engraving, p. 60.
† Attics, c. xxi.

* Rome in the Nineteenth Century. Anonymous. Edinburgh: Constable. 4th Edition.

† See Engravings, p. 58.

‡ Corinthians, c. vii.

§ Phocæa, c. xxv. and xxi.



THE RENAISSANCE COURT.

THE Rome of the Cæsars is separated from the Rome of the popes by a dreary interval of many centuries. Viewed as a whole it is a disastrous period, in which barbarism triumphed over civilisation: the ancient mistress of the world succumbed to the prowess of foreign invaders. Alaric, Genseric, Attila, Theodoric, Ricimer, Vitiges, Totila, Luitprand; the Goths, the Vandals, the Huns, the Visigoths, the Lombards; all these historic names of fearful import—all these warlike nations, whose footsteps are tracked in blood, played their part in despoiling and destroying the city of Romulus and Augustus. At a later date, what the barbarians spared the Christians ruined: their early zeal overthrew pagan temples and broke pagan statues, sanctuaries of heathenism and the emblems of idolatry. In the civil wars of the middle ages, the more solid structures—which had resisted the decay of time, and defied or escaped the arm of violence—were converted into fortresses, garrisoned by the rival nobles, by the German Cæsars, by Robert Guiscard and the Normans, by the adherents of the popes, by the chiefs of the Guelph and Ghibelline factions. Thus the Orsini, in the eleventh and twelfth centuries, occupied the Mole of Hadrian and the Theatre of Pompey; the Colonna, the Mausoleum of Augustus, and the baths of Constantine. The Conti were in the Quirinal. The Frangipani had the Coliseum, the Septizonium of Severus, and the Janus of the Forum Boarium. The Savelli held the Tomb of Cecilia Metella; and the Corsi fortified the Capitol. The Pantheon received a papal garrison. The Tomb of Hadrian withstood many sieges; and, in the vicissitudes of fortune, received many names—such as the Prison or House of Theodoric, the Rocca, the Castello di Crescentino, and, finally, that of the Castle of St. Angelo, which it retains to this day. It was the most important of all the fortresses; and, in the year 1382, Pope Boniface IX. was advised to fortify it according to the most approved rules of military art, if he wished to retain permanent dominion over Rome. He followed that advice; and, by so doing, firmly established the papal throne. At a still later date, in 1527, the troops of Charles V. of Spain, commanded by the Constable of Bourbon, sacked Rome, when the churches and palaces were pillaged, nor was respect paid even to the chambers of the Vatican or the frescoes of Raffaello.

In the description given in this work of the Roman Court, some account was given of the progress of architectural and artistic embellishments in ancient Rome; it is now proposed, as introductory to our description of the Renaissance and Italian Courts (which are separate sections of one and the same subject), to point out briefly but substantially the more prominent causes of the ruin of the ancient monuments.

During the republic and the empire many of the most ancient structures were impaired by time, and not restored. Horace reproaches his countrymen for neglecting the mouldering fanes of the gods; and speaks of the overflowing of the Tiber, which had thrown down the old Temple of Vesta, and the monuments of the kings. Similar inundations have been frequently recorded, and fire also was an active instrument of destruction. That of Nero, and its devastating effects, are thus described by Suetonius:—"Somebody in conversation saying,—

'When I am dead, let fire destroy the world.'

'Nay,' said he, 'let it be while I am living.' And he acted accordingly; for pretending to be disgusted with the old buildings, and the narrow and winding streets, he set the city on fire, so openly that many of consular rank caught his own household servants on their property with tow and torches in their hands, but durst not meddle with them. There being near his Golden House some granaries, the site of which he exceedingly coveted, they were battered as if with machines of war, and set on fire, the walls being built of stone. During six days and seven nights this terrible devastation continued, the people being obliged to flee to the tombs and monuments for lodging and shelter. Meanwhile, a vast number of stately buildings—the houses of generals celebrated in former times, and even then still decorated with the spoils of war—were laid in ashes; as well as the temples of the gods, which had been vowed and dedicated by the kings of Rome, and afterwards in the Punic and Gallic wars; in short, everything that was remarkable and worthy to be seen which time had spared."

This destructive fire occurred in the end of July or the beginning

of August, in the year 64 of our era, or, reckoning from the building of the city, in the year 816. It is true that succeeding emperors repaired much of this damage, and, notably in the age of Trajan and the Antonines, many new and magnificent buildings were erected, but it was impossible to recover the consumed monuments of antiquity: it was a new Rome that arose on the ruins of the old, just as in our times the Rome of the popes has little in common with the Rome of the Cæsars.

Gibbon, in describing the state of Rome under the reign of Honorius, when the Gothic army of Alaric blockaded the city, offers the following remarks to determine its populousness:—1. "When the capital of the empire was besieged by the Goths, the circuit of the walls was accurately measured by Ammonius, the mathematician, who found it equal to twenty-one miles. It should not be forgotten that the form of the city was almost that of a circle, the geometrical figure of which is known to contain the largest space within any given circumference. 2. The architect Vitruvius, who flourished in the Augustan age, and whose evidence on this occasion has peculiar weight and authority, observes, that the innumerable habitations of the Roman people would have spread themselves far beyond the narrow limits of the city; and that the want of ground, which was probably contracted on every side by gardens and villas, suggested the common though inconvenient practice of raising the houses to a considerable height in the air. But the loftiness of these buildings, which often consisted of hasty work and insufficient materials, was the cause of frequent and fatal accidents: and it was repeatedly enacted by Augustus, as well as by Nero, that the height of private residences, within the walls of Rome, should not exceed the measure of seventy feet from the ground. 3. Juvenal laments, as it should seem from his own experience, the hardships of the poorer citizens, to whom he addresses the salutary advice of emigrating, without delay, from the smoke of Rome, since they might purchase, in the little towns of Italy, a cheerful commodious dwelling, at the same price which they annually paid for a dark and miserable lodging. House-rent was, therefore, immoderately dear; the rich acquired, at an enormous expense, the ground, which they covered with palaces and gardens, but the body of the Roman people was crowded into a narrow space; and the different floors and apartments of the same house were divided, as is still the custom of Paris and other cities, among several families of plebeians. 4. The total number of houses in the fourteen regions of the city is accurately stated in the description of Rome, composed under the reign of Theodosius, and they amount to 48,382. The two classes of *domus* and of *insula*, into which they are divided, include all the habitations of the capital, of every rank and condition, from the marble palace of the Anicii, with a numerous establishment of freed-men and slaves, to the lofty and narrow lodging-house, where the poet Codrus and his wife were permitted to hire a wretched garret immediately under the tiles. If we adopt the same average, which, under similar circumstances has been found applicable to Paris, and indifferently allow about twenty-five persons for each house, of every degree, we may fairly estimate the inhabitants of Rome at 1,200,000,—a number which cannot be thought excessive for the capital of a mighty empire, though it exceeds the populousness of the greatest cities of modern Europe."

Such then is the description of Rome when first assailed by the barbarians; and it is from this epoch that we must date the destruction of its architectural and artistic beauties by the hands of foreign foes. It may be observed, however, that the concluding remarks of the great historian of the *Decline and Fall* are no longer true, since modern London contains more than twice the population of Rome under the reign of Honorius.

Pope, in his poetical epistle to Addison, enumerates on a very extensive scale the several causes which destroyed the ancient city and its splendid edifices:—

"Some felt the silent stroke of mouldering age,
Some hostile fury, some religious rage;
Barbarian blindness, Christian zeal conspire,
And Papal piety, and Gothic fire."

The inquisitive reader is not satisfied with so general a statement, but desires to know, with some approach to exactitude, the special operation of each of the causes assigned. Gibbon is not inclined to follow the general opinion, which accuses the barbarian invaders of

excessive devastation, remarking that the Goths evacuated Rome on the sixth, and the Vandals on the fifteenth day; in justification of this view he appeals to the monuments which Theodoric beheld and admired, which must have been spared by Alaric and Genseric; and describes the resentment of Totila as "momentary." "From these innocent barbarians," he says, "the reproach may be transferred to the Catholics of Rome," who certainly did destroy many of the temples and statues; but Gibbon allowed his prejudices to cloud his judgment when he characterises the barbarians as innocent. Mr. Hobhouse has investigated this subject laboriously, and summed up the evidence with impartiality and judgment. He arrives at conclusions very different from those of the great historian.

"Pope Gelasius, in a letter to the senator Andromachus, A.D. 496, has the words, 'when Alaric overturned the city.' Procopius confines the fire to the quarter near the Salernian gate, but adds that the Goths ravaged the whole city. The despoiling edifices of their ornaments, many of which have been connected with their structure, cannot fail to hasten their decay. Marcellinus mentions that a part of Rome was burnt; and delays the departure of the barbarians to the sixth day. Cassiodorus, a much earlier and better authority in every respect than the three last writers, assures us that many of the wonders of Rome were burnt. Olympiodorus talks only of the infinite quantity of wealth which Alaric carried away; but we may collect from him also how great was the disaster, when he tells us that on the re-peopling of the city 14,000 persons returned in one day. The injury done by Genseric (A.D. 455) was not so great as that of the Goths; and Da Barga dispatches his invasions in a few sentences. Jornandes, however, applies the expression *devastation* to his entry. All the writers are of accord that the Vandals, in their fourteen days residence, emptied Rome of her wealth; and as we are informed of the robbery of half the tiles of the Temple of Capitoline Jupiter, and of the Palace of the Cæsars, it is reasonable to suppose that the precious metals were extracted and torn down from all the structures, public and private,—a violence which, without the use of fire or engines, must have loosened many of the compact masses, and been totally destructive of smaller edifices. An ecclesiastical historian twice mentions that Genseric set fire to Rome, but the silence of other writers has discredited his authority. The sack of Rome by Ricimer (A.D. 472) is generally overlooked by the apologists of the early invaders; but it should not be forgotten that the barbarians, Arians, and infidels, were indulged by the Patrician in the plunder of all but two regions of the city. Considerable stress has been laid on the grandeur of the structures which still remained, after the above calamities, to be admired by Theodoric, but the praise of what is left does not include proof that little has been lost; were it so, Rome would appear to have not suffered much even in the middle ages, when her fragments were the wonder of the pilgrims of every nation. It must besides be remarked that the larger monuments—the Forum of Trajan, the Circus Maximus, the Coliseum, the Capitol, the Theatre of Pompey, the Palace of the Cæsars—are those particularly recorded by the minister of the Gothic monarch, and of those the two latter were in want of repair. A palace partly in ruins on the Pincian Hill, marbles and square blocks everywhere lying prostrate, the desertion and decay of many houses, must, partially at least, be attributed to the fire of Alaric, the spoliation of the Vandals, and the sack of Ricimer. To Vitiges, who came down on Rome like a raging lion, must be ascribed the destruction of the aqueducts, which rendered useless the immense *thermae*; and as these appear never to have been frequented afterwards, their dilapidation must be partially, but only partially, attributed to the Goths. Vitiges burnt everything without the walls, and commenced the desolation of the Campagna. Totila is known to have burnt a third part of the walls; and although he desisted from his meditated destruction of every monument, the extent of the injury inflicted by that conqueror may have been greater than is usually supposed. Procopius affirms that he did burn 'not a small portion of the city,' especially beyond the Tiber. An author of the *Chronicles* records a fire, and the total abandonment of the city for more than forty days; and it must be mentioned that there is no certain trace of the Palace of the Cæsars having survived the irruption of Totila. It must have been at his second entrance that this monarch 'lived with the Romans as a father with his children,' and not at the first, as might be thought from the annals of Italy. In the five captures of Rome, from 536 to 552, in which she was both attacked and defended by barbarians, it is impossible but that many of the architectural ornaments of the city

must have been partially destroyed or partially injured; and the particular mention made by Procopius of the care taken by Narses to restore the capital is an evidence of the previous injury. With Totila the dilapidation of Rome by the barbarians is generally allowed to terminate."*

We have now to consider the injuries inflicted by the religious zeal of the Christians, which were of two distinct kinds, and were perpetrated at two distinct epochs. The first are to be referred to their detestation of paganism, which prompted them to destroy temples and statues; the second arose from the desire of several of the popes to build a new city, for which purpose they used as materials what remained of the old city.

The primitive Christians, descended from Jews, detested graven images, and regarded with horror the statues of the heathen gods and goddesses, and also the splendid buildings in which they were enshrined. After the conversion of Constantine, fanaticism or excessive piety impelled them to mutilate or annihilate the memorials of pagan antiquity. To these noble objects of art Constantine himself had shown no respect, although he had been born in the faith of the deities of Olympus. He authorised the sale of statues, now stigmatised idols, in Greece. It is known that he plundered the Arch of Trajan to decorate with its spoils the one that bears his own name. This act of desecration powerfully influenced the public opinion of his era, and the people did not hesitate to imitate the example of their emperor, and naturally ceased to respect what he had insulted; and though the temples were not closed by imperial authority till the edict of Honorius was promulgated in the year 399, yet long before that date the ancient structures had lost their sanctity, and the work of devastation had been extensive. "The golden Capitol has lost all its splendour," writes St. Jerome; "the temples of Rome are covered with dust and cobwebs; the very city is moved from its foundations; and the overflowing people rush before the half torn up shrines to the tombs of the martyrs." In the year 426, Theodosius the Younger positively commanded the destruction of the pagan temples, on which Cardinal Baronius observes, "As soon as this long-desired permission to break the idols was obtained from the Christian prince, the just zeal of the Christian people broke out at last in the throwing down and breaking of the pagan gods. It is incredible with what animosity the faithful at Rome leapt on the idols." As the scene on which the Christian martyrs were delivered up to wild beasts, the Circus Maximus was held in special abomination; and Mr. Hobhouse considers that Gregory the Great was very active in its destruction.

Had this pious spirit of destructiveness continued to rage with the fierceness described by Baronius, not a vestige of antiquity would have escaped the hand of violence, excepting those productions of art which were protected by the ruins in which they were concealed, or those massive structures whose solidity constituted their defence; but a change came over public opinion when the revival of paganism was deemed impossible. During the persecution of the early emperors, the Christians performed the ceremonies and mysteries of their religion in the obscurity of the catacombs; and, at a later date, the worship of martyrs arose from out those dreary regions. Pilgrims visited those gloomy abodes, which warmed their piety, inspired fortitude, and imparted consolation; and it was their highest pleasure to carry to their distant homes some memorial of those who had sacrificed their lives for the sake of conscience, and, as demand stimulates production, relics multiplied. The *basilicæ* of the heathens, once ruthlessly defaced and demolished, were now converted into Christian churches, after the bricks or marble had undergone an orthodox purification. "There is something very suggestive in this," observes Ranke. "The apsis of the basilica contained an *augustæum*, the images of those very Cæsars to whom divine honours had been paid. To their places succeeded, as we see in so many basilicæ to this day, the images of Christ and his apostles; instead of the world's masters, who were themselves regarded as gods, appeared the Son of God clothed in the nature of man. The local deities faded away. On every highway, on the mountain cliffs, and in the passes through the ravines, on the housetops and on the mosaics of the floors, were seen the emblems of the cross. The victory was complete and decisive."†

According to Gibbon, "the use, and even worship, of images was

* Illustrations of Childe Harold. By John Cam Hobhouse.
† Ranke's History of the Popes.

firmly established before the end of the sixth century." This worship, however, was denied to have any resemblance to that of paganism; and a distinction was attempted to be drawn between the literal and symbolical adoration of statues and paintings. The former alone was pronounced idolatrous; the latter was declared to be not only innocent but holy. This subtlety, however, clumsily disguised a return to the old superstition. The Emperor Julian, surnamed the Apostate, in one of his replies to the early Christian polemics, at a time when their religion was purely spiritual, has left on record the sentiments of the heathen world on the subject of idol worship.

"The statues of the gods," says Julian, "the sacred fire kept burning in their honour, and, in general, all symbols of this nature,

have been consecrated by our ancestors as signs of the presence of the gods; not that we worship them literally, but that, through their aid, we may have a more sensible idea of the existence of the celestial deities. The gods, being spiritual and incorporeal, have presented to our view substantial images of themselves in those heavenly bodies which are eternally circulating in the firmament. Now, as we cannot pay an immediate worship to the first order of deities, who in truth do not require our homage, we have established a third order of gods on the earth in images and statues; and the reverence paid to these symbols conciliates the favour, and ensures the protection, of the first order of deities. For, as they who honour the statues of princes procure their patronage and regard, although this homage in no respect increases the happiness of the prince, so, in like manner, we worship the images of the gods, who, though not benefited by our adoration, nevertheless reward our pious gratitude by their favours. It is among

the proofs of a truly religious mind to render to the deities all the homage in its power; for, although it neither adds to their glory or happiness, it is still the duty of the creature to adore the Creator. We ought not only to sing hymns in their praise, but to honour them with the works of our hands, with images and statues, which mode of adoration has for three thousand years been a distinguishing feature in all the religions of antiquity." Julian then discusses the particular point of idol worship. "We are not so blind or ignorant," says the emperor, "as to regard as gods the manufactured productions of our own hands; neither do we consider our images and statues as mere pieces of wood and stone, nor as actual deities. No one views the statues of our princes as simple pieces of wood, stone, or bronze,

nor as real sovereigns, but as the representatives of individuals whose memory we cherish. Whoever loves his king, is pleased with possessing his statue or his picture; the father who loves his son, the son who loves his father, are both gratified at beholding that which recalls the features of the original. For a similar reason, he who reverences the gods contemplates with satisfaction their statues and images, adoring with pious awe those invisible beings, whose eyes are always fixed upon his conduct. These images, formed by our hands, may be destroyed; but those which the first order of deities have created, as visible representatives of themselves (*i.e.* the celestial bodies), are incorruptible and indestructible."*

These extracts from Julian's defence of paganism clearly show the sense in which the ancients interpreted idolatry, and that the

worship they paid to graven images was not literal but symbolical; whence it follows that when the popes introduced what they styled a purified system, they actually adopted the practices of the very heathenism they condemned. This view of the subject may be confirmed by a reference to the great polemical work of Bossuet. "To set up images," says that celebrated writer, "is to make more palpable the mysteries and examples which sanctify us. This institution may be misunderstood in three ways by the ignorant. They may imagine that the divine nature is really represented; or, that it is contained in images; or, images may be supposed to be filled with certain virtues, on account of which they are honoured. These are three varieties of idolatry. But the Council of Trent has rejected these errors in precise terms, so that it is not permitted to attribute to one image more virtue than to another, unless indeed in memory of some miracle, or on account of some pious history, calculated to excite feelings of devotion. Luther

himself, and the Lutherans, will prove that the worship of images thus purified does not fall within the prohibition of the decalogue; and the adoration paid to them is nothing more than a sensible outward testimony of a pious recollection which they excite. The simple and natural effect of the silent homage attached to these holy representations becomes doubly useful, because it falls within the comprehension of all mankind."†

There is no substantial difference between Julian the Apostate, and Bossuet, Bishop of Meaux; but there was the greatest possible



FAÇADE OF THE RENAISSANCE COURT.

* Jul. Imp. Fragmenta, pp. 537, 540.

† Histoire des Variations, t. ii. p. 641.







difference between the Western and Eastern Churches; and the Emperor Leo, the Isaurian, became the formidable antagonist of the popes. If the latter protected the statues and temples against iconoclastic zeal, the ultimate result of their policy brought down new devastations on Rome, for which reason we have dwelt on the revival of this form of idolatry, and must note its historical consequences.

Leo III., surnamed the Isaurian, on ascending the imperial throne of Constantinople, determined on suppressing the growing worship of idols. His first measure was cautious and moderate; for he only ordered the images to be removed from the sanctuaries and altars, and placed in the higher parts of the churches, where they were still visible. In this procedure he seems to have thought that distance might damp the superstitious earnestness of the devotees, and prepare them for a more decided blow. He next forbade the exhibition or use of all religious pictures; and over such as were painted on the walls he passed an effacing coat of plaster, while the statues of Christ, the virgins, and the saints, were demolished. His son,

deprived the Byzantine emperors of the revenues and dominion of Italy.

It was at this period that the Lombards, under their king, Luitprand, and afterwards under his successor, Astolphus, threatened Rome, and compelled it to pay a capitation tax in the form of a tribute. From this subjection and danger it was rescued by Pepin, King of France, and his successor Charlemagne, at the earnest entreaties of the pope, Stephen III.; and, as Gibbon has remarked, "the mutual obligations of the popes and the Carolingian family form the important links of ancient and modern, of civil and ecclesiastical, history."

Charles Martel, the founder of this line, saved Christendom from the imminent danger of Mahometan conquest; and his son, Pepin the Younger, expelled the Lombards from the papal territory in Italy, and from the exarchate. Nor did he restore the exarchate to the emperors of the East, to whom it belonged: on being called upon to do so, he answered, that "he had not taken the field for a man, but solely out of his veneration for St. Peter, to the end that he might



PALACE OF THE CÆSARS.

Constantine, convened in the immediate neighbourhood of Constantinople a synod of three hundred and thirty-eight bishops; and, after a discussion which lasted six months, they unanimously signed a decree, which in substance affirmed the following propositions:—That all visible symbols of Christ, except in the Eucharist, were either blasphemous or heretical; that image-worship was a corruption of Christianity, and a renewal of paganism; that all such monuments of idolatry should be broken or erased; and that those who should refuse to deliver up the objects of their private superstition, were guilty of disobeying the authority of the Church and the emperor. Rebellion followed this decree; but, after a brief struggle, it was effectually suppressed. It was otherwise in the Western Church, where the attempt to enforce iconoclastic principles was successfully resisted; and the pope triumphed where the patriarch of the East had unwillingly succumbed. Then occurred the separation between the two churches; and papal authority, strengthened by external aid,

obtain forgiveness for his sins." He caused the keys of the conquered towns to be laid on St. Peter's altar. This, says Ranke, was the foundation of the whole temporal dominion of the popes.

Charlemagne followed up the policy of his father, Pepin, all whose acts in favour of the papacy he confirmed on visiting Rome, when he kissed the steps of St. Peter's Church as he ascended to the altar and on Christmas-day, in the year 800, he was crowned by the pope Emperor of the West. Thus a Frank sovereign succeeded the Cæsars, and exercised supreme authority in the territories which the Carolingian princes had conferred on the pope; and the complete temporal dependence of the pontiff is placed beyond doubt by the fact that Lothaire, nephew of Charlemagne, appointed his own judges, and annulled confiscations made by the pope. This is stated on the authority of Ranke. The pope, however, became supreme lord of the hierarchy in the Roman west, and a member of the Frankish empire. The Greek emperors had long since despoiled him of his eastern diocese. Ranke, in a note, quotes part of a letter

written by Nicholas I., in which that pontiff bewails the loss of the patriarchal power of the holy see in ancient and modern Epirus, Illyria, Macedonia, Thessaly, Achaëa, Dacia, Dardania; and the loss of the patrimony in Calabria and Sicily. He couples this letter with one from Hadrian I. to Charlemagne, from which it appears that this loss arose out of the iconoclastic controversy.

At the date of Charlemagne's era all the Western churches, including the Lombard, recognised the pope as their spiritual chief. When the Frankish Empire was prostrated, the German Empire acquired undisputed ascendancy. But disputes again arose, and gave rise to the celebrated factions of the Guelphs and Ghibellines, the former espousing the cause of the popedom, the latter upholding the pretensions of the empire. This state of things is clearly shown in a brief compass by Ranke.

"The popedom," says that historian, "was bound to the German emperors by the strictest ties, as it had been to the Roman emperors, and to the successors of Charlemagne. True, indeed, the popes had exercised acts of sovereign authority over the imperial sceptre before it passed definitively to the Germans, and while it was yet in weak and wavering hands. But when the vigorous princes of Germany had achieved the conquest of that dignity, they became, if not admittedly, at least in fact, what the Carolingian race had been, the liege lords of the popedom. Otho the Great shielded with a powerful hand the pope whom he had seated on the pontifical chair; his sons followed his example. The fact that the Roman factions did once make head, and seize on or resign that dignity as their family interests fluctuated, and purchase or traffic it away, did but more clearly indicate the necessity of some higher intervention. It was well known how vigorously this was executed by Henry III. His synod at Sutri deposed the intruders upon the popedom. No sooner had he put the patrician ring on his finger, and received the imperial crown, than he declared of his own good pleasure the individual who was to mount the Papal Chair. Four successive German popes were nominated by him. Upon the occasion of a vacancy in the highest station of the church, the delegates from Rome presented themselves at the imperial court, exactly as the envoys from other bishoprics, to receive the announcement of a succession to the dignity. In this position of things, it was a matter of personal interest to the emperor that the papacy should wear an imposing aspect in the eyes of the world. Henry III. promoted the reformation, which was undertaken by the popes appointed by himself; the augmentation of their power in no wise moved him to jealousy. That Leo IX. held a synod at Rheims in defiance of the king of France, instituted and deposed French bishops, and received the solemn admission of the principle that the pope is the sole primate of the universal church, might perfectly suit the emperor's purpose, so long as he himself had the disposal of the popedom. All this contributed to uphold that paramount majesty which he claimed over all Europe. What the archbishop of Bremen effected for him in the north, the pope obtained for him amongst the other powers of Christendom. . . . The pope was now confessedly a spiritual prince, and also exercised considerable political influence. Under a feeble line of German sovereigns, and a vigorous succession of bold pontiffs, the spiritual authority might have become wholly independent; this was the danger to be apprehended, and it happened. Gregory VII. caused a resolution to be passed in one of his ecclesiastical assemblies to this effect:—That in the future no spiritual appointment should ever be disposed of by a secular patron. This was of a nature to overthrow the constitution of the empire in its very essence. It took place during the minority of Henry IV., when the empire was convulsed. The pope insisted that Germany was an electoral empire, which pleased the princely electors; and, as the doctrine suited their political ambition, they connived at Gregory casting off the imperial yoke."

The popes, however, did not consolidate their independence till after protracted and desperate struggles, in which many of them were outraged and some slain. During the wars of the middle ages between the Church and the empire, Rome itself was the scene of many combats, which proved more destructive to the city and the ancient monuments than all the earlier incursions of the barbarians. However, when the papal authority became firmly established, new buildings arose; and the arts of construction were stimulated by a discovery of the writings of Vitruvius. Pope Nicholas V., elected in 1447, was one of the most zealous of the renovators; but he prosecuted his plans by despoiling old edifices. Sixtus IV., in 1480, proposed almost a total reconstruction of the city; and this date has

been fixed upon as the epoch of the final destruction of every portion of the old city which might have been confounded with the Rome of the middle ages.

The word "*Renaissance*" is a compendious term, denoting the new birth or revival of the efforts of human intellect in literature, art, and science. It is a point of departure in the career of civilisation, though it is impossible to fix definitely the exact period when the onward movement commenced. Nor is it true that all the lights of knowledge were extinguished in the downfall of the Western Empire. The south of Italy was never sunk so low in barbarism as the north. At Naples, for example, the refinements imparted by Greece were never wholly effaced; and Grecian vases and medals were always before the eyes of Neapolitan artists. At Sienna, according to Theodore Ducas, painters exercised their art in the twelfth century. That traveller mentions a picture of Guido, a Siennese, in the Church of St. Dominic, dated in the year 1221; and refers to Simon Memmi of Sienna, who flourished at the close of the thirteenth and first half of the fourteenth century, who painted Petrarch and Laura, and is celebrated by that amatory poet in two sonnets. At Bologna the study of the Roman laws had never been suspended; and it is a popular error to suppose that a discovery of the Pandects, at the capture of Amalfi by the Pisans, in the year 1137, revived the study of Roman jurisprudence, for it had never been forgotten. "Prior to that date," observes Ducas, "Irenæus, a German by birth, but a Constantinopolitan by education, read at Bologna lectures on the Pandects; and, contemporary with him was Gratian, who, in the same city, reduced the canon law into method. At Bologna the influence of Roman intellect was never effaced."

Even in the tenth century, the instructions and writings of the Arabian doctors and philosophers were sensibly felt in those parts of Spain and Italy where they had founded schools. The Arabians derived a knowledge of physic from the Greeks, and they prosecuted the study of it with ardour, if not always with judgment. It is certain that we owe to them most of our spices and aromatics—as nutmegs, cloves, and mace. Most of the gentler purgatives were unknown to the Greeks, and first introduced by the Arabs—as manna, senna, rhubarb, tamarinds, and cassia; and it is generally admitted that the Arabian physicians were the first who discovered the nature of the smallpox and the measles. Beneventum and Sicily were so often occupied by the Saracens, that oriental literature and customs insensibly blended themselves with the Italian mind. A college of medicine arose at Salerno, for which the Emperor Frederick II. formed several regulations, which became the model of several similar institutions established in other countries. Theodore Ducas has given an interesting account of some of the rules. As the practice of physic was considered a part of Christian charity, medical practitioners were forbidden to take fees from the poor. They were obliged to visit their patients twice a day, if they lived within the walls of the physician's town. The sick man might disturb his doctor once in the night; and all the three visits were to be compensated by a fee of twenty pence. Physicians were not allowed to keep a shop, or to agree with an apothecary for the price of medicines. Druggists were obliged to have attestations of merit from the faculty, and to swear that they would prepare medicines according to the Pharmacopœia of the Salernitan school. The price of medicines was also regulated. The apothecary and druggist of every town were under the inspection of superiors appointed by the Salernitan College. That college stood high in name during four centuries; but, finally, its fame was eclipsed by those of Paris and Bologna. Frederick II. of Sicily, who thus promoted medicine at Salerno, became emperor in 1218, and was an early promoter of literature and science, and may be considered one of the most enlightened pioneers of the revival.

The zeal of the Roman emperors for the Christian religion was measured by their persecution of the pagan philosophy. We have seen that they destroyed the statues and temples of heathenism. Ignorant and vindictive monks wreaked their vengeance on the books that contained the old mythology. Libraries were despoiled or burnt. In the year 529, Justinian closed the schools of Athens, where Plato and Aristotle were taught. The successors of Justinian destroyed the literary institution of Edessa, because that university of the eastern parts of the empire had received some heretical corruptions. Even the historical writings and the lyrical poetry of the ancients perished by the mandate of monkish authority; and the laity were commanded to read the "divine poems" of St. Gregory

Nazianzen, instead of the amatory effusions of the Grecian muse. A council, held at Carthage, forbade bishops from reading classical authors; and, observes Ducas, Jerome, whose authority was not inferior to that of any council, censured the young clergy for studying comedies and Virgil, to the neglect of the prophets and evangelists. Orthodox education consisted in reading the church service and singing the church music. The ancient hymns are traced to the fourth century, and were probably imitated from the temple-worship of the heathens. The fathers paid great attention to the culture of church music; and a prescribed form of singing is believed to have been first organised at Antioch, for in that city is recorded the earliest establishment of monks devoted to the practice of perpetual psalmody, in imitation of the perpetual sacred fires of antiquity. According to Ducas, Ambrose, Bishop of Milan, in the fourth century, borrowed his melodies from Antioch, and introduced them into his episcopal city, which was the first place in the West wherein psalms and hymns were sung after the oriental form. The service performed in this manner was known by the name of the "Ambrosian Chant." Gregory the Great, two hundred and thirty years after the time of Ambrose, reformed the chant. In the seventh century the first organ ever known was set up at Rome. Pope Vitalian will always be remembered as the pontiff who effected this great improvement in church music. The instrument was blown by bellows, and played with keys, and was much more serviceable than the hydraulicon, or water-engine. Both instruments were of Grecian origin. The wind organ had been used in the churches of Constantinople so early as the days of Julian the Apostate. The first ever known in France was presented by the Emperor Constantine Copronymus VI. to King Pepin.*

In this dark—but not wholly dark—epoch, which preceded the Renaissance, or Revival, in the enlarged and just sense of the term, we have already alluded to the practice of medicine. In fact, the healing art, in some form or other, must always have been, as it must always continue to be, a necessity; and, in the most ignorant age, its rudiments can never have been lost or overlooked. In the decline and fall of the Western Empire, the monks were the surgeons and physicians; and they considered it a part of their sacerdotal duty to cure the sick, although they were unversed in the science of medicine or anatomy. Prayers, the relics of saints and martyrs, processions, holy water, and holy oil, were the remedies on which they chiefly relied; and they invoked the saints to cicatrize wounds and reduce fractures. Astrology was a component of their pharmacopœia, or an appendix to it; and the stars and planets were consulted before the curative herbs were prescribed. On this superstitious system the wiser Arabians largely innovated, for they had made some progress in botany and chemistry. Surgery was in the lowest condition, as a mistaken respect for the dead repudiated dissection, and even deemed it an act of impiety; hence there was no anatomical knowledge. This prejudice, however, was at length overcome. In the year 1315, Mondini di Lazzi, professor of medicine at Bologna, publicly dissected two human subjects, and wrote a description of the operation. He is the restorer of anatomy, which the sculptors and painters minutely studied at a later date; and he deserves to be honoured as one of the pioneers of the civilising movement. Surgical knowledge having now advanced, the clergy were forbidden to visit hospitals in a medical capacity; but a papal decree impaired the utility of this wise enactment of the Council of Vienna, held in 1312, as it ordered that no practitioner should visit a patient twice without sending for a priest to take care of the salvation of the patient's soul. If a patient died under a surgical operation, the surgeon was subjected to heavy penalties, so that in difficult cases few dared to use the knife, or venture beyond the application of plasters and unguents; thus an anxiety for the soul, most laudable in itself, frequently killed the body.

In the middle ages books were extremely rare. In the seventh century many provinces did not possess a single volume. Denina, Professor of Literature and the Belles-Lettres at the Royal College of Turin, has recorded some curious facts on this subject. He says that the library of the pope was insufficient for the personal study of the pontiff. St. Amand, Bishop of Maestricht, wrote to Pope Martin to lend him some for his edification. Lupus, Abbot of Ferrières, in Gatinois, requested Pope Benedict II. to lend him Cicero's treatise, *De Oratore*, and one of the volumes of Quintilian, for which purpose he sent two of his monks to Rome. Books were

so scarce in Spain in the time of Gennadius of Astorga, that Denina, quoting Fleury for his authority, asserts, that in the commencement of the tenth century several monasteries established among themselves what would be called a "Book Society," borrowing from and lending to each other: and he mentions among others the Bible, the Reflections of St. Gregory on Job, and the Letters of St. Jerome. At length an ardent desire arose among a few enlightened men to ascertain the literary contents of the cloister, and save the remnants of ancient learning from destruction. In this effort the zeal of the celebrated Boccaccio was conspicuous. He collected, with the greatest care, several Greek and Latin manuscripts, and copied such as he could not purchase. In a journey to Mount Cassius, generally considered to be rich in manuscripts, he was surprised and grieved to find the library exiled from the monastery into an adjoining barn, which was accessible only by a ladder. In many books he opened the writing had been effaced by damp. The monks told him that it was their practice to erase an ancient writing, and compose on it psalters and legends, which they sold to women when they wanted money. The monkish practice of erasure was caused by the excessive scarcity of writing materials. The fabrication of parchment greatly declined after the conquest of that country by the Saracens; and it was not till the fourteenth century that the Arabic art of making paper out of linen was generally cultivated in Europe. After the twelfth century, however, the treasures of antiquity were no longer confined to the treacherous custody of the monks, who, about that period, ceased to be the librarians of Europe. Manuscripts were thenceforth copied in universities, and their transcription became a regular department of trade. Printing belongs to a later date in the progress of the revival of learning and art.

In respect to painting, sculpture, and architecture, the Renaissance is usually divided into three periods. The first is the preparatory epoch, or thirteenth and fourteenth centuries—the age of Cimabue and Giotto, as artists; of Nicolo, Giovanni, and Andrea Pisano, as sculptors; of Arnolfo di Lupo and Andrea Orgagna, as architects. Of these, however, some practised the three departments of art, as did others, their contemporaries. During this epoch the earliest attempts were made not only to revive the antique style, but also to imitate nature; and, if the works then executed were imperfect, they nevertheless furnished models to which a later school adhered and greatly improved. The next epoch is that of the fifteenth century, in which very considerable progress was made. Among its celebrities, as painters, were Paolo Uccello, Massaccio, and Dominico Ghirlandajo; as sculptors, Jacopo della Quercia, Luca della Robbia, Lorenzo Ghiberti, and Donatello; as architects, Brunelleschi, Michelozzi, and Leon Batista Alberti. The third period, in which art was carried to perfection, is illustrated by the names of Leonardi da Vinci, Raffaello d'Urbino, and Michael Angelo.

In treating of the Renaissance Court in the Crystal Palace, we must confine our remarks to the two first of these epochs; the third belongs to the Italian Court. We propose to give some biographical sketches of the painters, sculptors, and architects of the two first periods, pointing out the successive improvements they effected, and describing the specimens of their age now exhibited in the palace at Sydenham. Before entering into details, it is proper to observe that after the downfall of the Western Empire the division of Italy into many independent principalities was highly favourable to the nourishment and expansion of Italian intellect. An active competition for fame arose, and every city had a Mæcenas sovereign—generous rivals in the restoration of literature and art. Hence were established the famous schools of Rome, Florence, Milan, Pisa, Bologna, Parma, Ferrara, Mantua, and Venice.

Cimabue, a native of Florence, born in the year 1240, and who lived till the year 1302, is considered the restorer of painting, so that his name creates an epoch in art. He studied under the Greek teachers of his day, whose works were rude, full of hard lines and sharp angles. This bad style he discarded, and proved himself an original genius in his fresco-paintings at the Hospital of the Porcellana, at Florence, where all the figures were of the size of life, and happy imitations of nature. The draperies and other accessories were free and flexible—a marked deviation from the rigidity that prevailed before Cimabue's time. For dry formality he substituted life and movement, and had the merit of striking into a new path. He was the pioneer of pictorial improvement, and this constitutes his glory.—Giotto, the son of a peasant, was born within

* Travels of Theodore Ducas.

the territory of Florence in the year 1276, and died in 1336. When a lad, he tended sheep. Cimabue observed him, when engaged in this occupation, drawing on a stone the figures of those animals, and was so struck with the rude efforts of his untaught genius, that he took the boy to his house, and became his instructor. Under such tuition he rapidly improved. Giotto diligently studied the antique, and is considered the father of the graceful style of painting. Vasari calls him the disciple of nature rather than of other masters. The same writer describes his thirty-two frescoes of the life and acts of St. Francis as worthy of all praise, both in design and execution. As an example of his fine imagination, special attention is drawn to the third compartment of that historical and allegorical work which exhibits "Poverty walking barefoot among thorns; a dog follows her barking, and a boy throws stones at her, while a second gathers the thorns about her, and presses them against her legs with a stick. This Poverty is here seen to be espoused by St. Francis, while Christ is holding her hand; and Hope, not without significance, is present, together with Charity." Another of his great works was the History of Job, in six frescoes, painted on the walls of the Campo Santo of Pisa; and he is associated with the greatest poet of modern Italy, having painted the portrait of Dante. Michael Angelo highly valued the painting of the Death of the Virgin, observing that nothing could approach more nearly to life, and such praise from such a judge is the highest that can be bestowed. Giotto also worked in mosaic. In this style is the picture known as the "Navicella," describing the Apostles navigating their boat through a tempestuous sea, which Vasari highly extols, declaring that "the spectator could almost believe himself to be looking at a real sail," though it was made of glass. In mosaic, Giotto had been preceded by Andrea Tafi and Gaddo Gaddi; but he improved greatly on the productions of those masters.

Margaritone of Arezzo, who belongs to this earliest epoch, made some mechanical improvements in the preparation of wood for painting, which deserves a passing notice as one of the movements then progressing. "It was his custom," says Vasari, "to cover the whole surface with canvas, which he secured by means of a strong glue, made from the boiled shreds of parchment; over this canvas he next applied a layer of gypsum, as may be seen in his pictures, as well as in those of others; on the gypsum, which was mixed with the glue above described, he thus formed diadems and other works in relief. He was also the inventor of grounding in bol-armonia, whereon he laid leaf-gold, which he discovered the means of fixing and burnishing." Margaritone was an architect as well as a painter, having given designs for the palace of the governors of Ancona, in the year 1270.—Stefano Fiorentino was a pupil of Giotto, and surpassed his master. He corrected former errors in perspective, and greatly improved that branch of art. He was the first to pay a careful attention to foreshortening, possessed very happy powers of invention, and excelled in harmonious colouring.

The earliest architect of this epoch was Arnolfo di Lupo, who was born in 1232, and died in 1310. He effected for architecture what Cimabue had done for painting. He erected the Church of Santa Maria del Fiore, at Florence, on which, at a later date, Brunelleschi piled up his celebrated cupola; and as it perfectly well supported that enormous weight, which Arnolfo never had supposed would have been placed upon it, this fact shows the judgment with which the foundations of the original building were constructed. It may be interesting to transcribe the measurements of this noble fabric as given by Vasari, considering it to be one of the earliest efforts of the Renaissance period. Its length from the door to the chapel of San Zenobio is 260 braccia, and the breadth across the transepts 166, that of the nave and side aisles 66; the height of the central nave is 72 braccia, that of the side aisles 48; the external circumference 1280 braccia; the height of the cupola, from the pavement to the base of the lantern, 154 braccia; the lantern is 36 braccia high, exclusive of the ball, which is 4 braccia, and the cross 8, making the whole height of the cupola, from the ground to the top of the cross, 202 braccia. The braccia of Florence is 1 foot 11 inches English measure.

Nicola and Giovanni Pisano, natives of Pisa, were both sculptors and architects. The former was born somewhere between 1205 and 1207, and died in 1278; the date of the birth of the latter is not fixed, but his death took place in 1320. Pisa was one of the earliest of the Italian republics that achieved commercial greatness,

and their fleets had brought from Greece many marbles, statues, and sarcophagi, executed by the ancient masters. Pisa founded its great church in the year 1016. It was built by Buschetti, generally supposed to be a Greek of Dulichium. In its construction he used some of the fragments of the old Grecian architecture which had been brought home by the Pisan navigators, which he ingeniously united with other materials. In 1063, the spoils which the Pisans brought from Sicily enabled them to add to the magnificence of their cathedral. They deposited in the bell-tower various capitals and fragments, which they brought from Greece and Sicily. Among these was an admirable sculpture of Meleager and the Calydonian Boar. These fine models Nicola diligently studied, and thus improved his taste and judgment. His most admired architectural work was the Campanile of San Nicola, at Pisa, celebrated for its spiral staircase, which Vasari informs us was afterwards imitated by Bramante in Rome, in the Belvedere of Julius II., and by Antonio di San Gallo, at Oviotto, for Pope Clement VII. Nicola worked in many towns of Italy, in all of which he left proofs of his genius. On the basement in the west front of the Cathedral of Oviotto there is a series of bas-reliefs, the work of Nicola Pisano and his school, representing subjects of the Old and New Testaments, from the Creation to the Last Judgment, with separate figures of the prophets. The different subjects are contained in a running foliage, making the most rich and beautiful decoration to the four basements formed by the three doors in that part of the church. The figures are each about twenty-two inches high, very carefully finished in statuary marble. There is in many of them a beautiful simplicity of sentiment; and in those of the Last Judgment, and in the other bas-reliefs that immediately relate to it, there are various striking instances of passion and terror.

Giovanni or John Pisano surpassed his father, and executed many figures in ivory. He deviated from his predecessors' rigid imitation of antiquity, in giving a more waving line to his figures, and broader and less determined folds to his draperies, like the paintings and designs of Giotto. There is a general grace and delicacy in the character of his figures, of which the bronze statues of a Madonna and Angels in the cathedrals of Oviotto and Florence are examples; and there is so strong a resemblance between the styles of these statues and those of Queen Eleanor at Northampton and Waltham, on her crosses, as affords reason to believe they were produced by one of John Pisano's ablest scholars, if not from some statue or model by himself, nor is it here that the resemblance ceases—for this style is to be traced in most of the sculptures of Europe, from this time to the reign of Henry VII. Among his pupils were Agostino and Agnolo di Siena, who improved on his style, and were highly recommended by the painter Giotto to the patrons of art. They were skilled in civil engineering, and extended their fame by confining the Po to its bed, after that river had broken its banks and caused a fearful inundation—a work at that time highly esteemed. They had many eminent pupils, who powerfully aided the progress of art. In this group may be classed Andrea Pisano, who brought an accurate taste and a fine judgment to bear on the study of the relics of antiquity collected in the Campo Santo of Pisa. He executed many sculptures for the Church of Santa Maria del Fiore, at Florence; among others a statue of Pope Boniface VIII., in marble, and the statues of St. Jerome, St. Ambrose, St. Augustine, St. Gregory, St. Stephen, and St. Lawrence; he completed one of the doors of the Church of San Giovanni, at Florence, after a design prepared by Giotto. It was of bronze, and recorded the life of St. John the Baptist, in which Andrea was assisted by his son Nino. This work afforded some hints to Lorenzo Ghiberti, who, at a later date, executed the magnificent door represented in the Crystal Palace. Nino Pisano achieved great fame by a whole-length figure of the Virgin offering a rose to her son, which is full of grace and tenderness. "The whole work is so beautiful," says Vasari, "that one may truly affirm that Nino has deprived the stone of its hardness, and imparted to it the lustre, polish, and vitality of flesh." Andrea Pisano died in the year 1345. Andrea Orgagna was one of his celebrated pupils, who displayed his talents in the threefold character of painter, sculptor, and architect.

We need not extend this list of some of the principal masters who flourished in the earlier or preparatory period of the Renaissance epoch. Beyond doubt they were surpassed by their successors, but they had the high merit of returning to the antique

style, and also of studying in the school of nature. It is a captious, a shallow, and an unworthy criticism, which dwells on faults that belong rather to the age in which they lived than to the masters themselves; they were men of creative minds, and depended mainly on their own mental resources.

In the second period of the Renaissance—that is, in the fifteenth century—the first name of authority that presents itself in the order of time is that of Jacopo della Quercia, who was born in 1374, and died in 1438. He was a sculptor of Siena, and is celebrated for the invention of a new style of modelling in that art. When

only nineteen years of age he was commissioned to execute an equestrian statue of a Siennese general. According to Vasari, he formed the body and skeleton of the horse from pieces of wood and small planks, which were afterwards swathed and wrapped with hay, tow, and hemp, being well bound and secured with ropes. The whole was then covered with clay mixed with a cement formed of paste, glue, and the shearings of woollen cloth. By this process the appearance of massiveness and solidity was gained, but when the materials were dried, they were very light, and being whitened, had the appearance of marble. The advantage of models of this description over those formed of mere clay consisted in their security against cracking; and as a mechanical contrivance, this improvement deserves to be here mentioned. The earliest works of this sculptor were executed for the cities of Siena and Lucca; and he may be considered the leading master of the second period of the Renaissance, as with him the improvement on the first period commenced. Among his finest productions were two tables carved out of the

wood of the lime-tree, on which, with the most delicate minuteness and fidelity, he represented the hair and beards of the figures represented on them, and they were deemed marvels of skill. They were placed in the Cathedral of Siena. In the same city he executed the fountain of the Piazza, and, on account of the excessive beauty of the decorations, his fellow-citizens called him Jacopo della Fonte. At Bologna he executed the marble door of the Church of San Petronio, which occupied him during twelve years, the whole of the foliage being the work of his own hands. The altar tomb of Flavia di Caretto, wife of Paolo Guinigi, Lord of Lucca, a copy of which is in the Crystal Palace, was executed by Jacopo della Quercia. The

figures of the boys in marble at the basement, supporting a garland, are praised by Vasari as seeming to be rather of flesh than of stone. On the sarcophagus was the figure of the lady buried within, and at her feet is a dog in full relief—the dog being the ancient emblem of fidelity; and it was placed on her tomb as the symbol of her attachment to her husband.

Luca della Robbia, of Florence, was born in 1440, and died in 1481. He commenced his artistic career by learning the art of a goldsmith, which he soon abandoned for the study of sculpture, working in bronze and marble. His profits from this pursuit do

not appear to have been commensurate with his wishes, and seeking to discover more economical materials, he revived the art of glazing terracotta, which was known to the ancients; but the practice of it was so far abandoned, and the knowledge of it so very imperfect, that Luca deserves to be called among the moderns, not only the restorer but the inventor of this beautiful department of Art. We learn from his biographer that after many experiments "he covered his clay figures with a coating of glaze, formed from the mixture of tin, litharge, antimony, and other minerals, prepared by fire in a furnace, and perfectly succeeded." By this new process he acquired great wealth, receiving so many orders that his works were not only scattered over Italy, but extensively demanded in France and Spain. Of this artist's productions the Crystal Palace contains a specimen in alto-relievo of the choristers singing, in different attitudes, in the cathedral at Florence, remarkable for the skill with which the inflation of the throats of the performers is represented.

Filippo Brunelleschi, born in 1377,

and who died in 1446, may be regarded as the reviver of ancient architecture. Originally a goldsmith and watchmaker, he afterwards studied sculpture under Donato,—more generally named Donatello,—and was the first among the moderns who classified the five orders of the ancients, and devoted himself earnestly to studying the antiquities of Rome. The work by which he is immortalised, is the cupola of the cathedral or church of Santa Maria del Fiore, at Florence, which structure was raised, in 1298, by Arnolfo di Lupo, as already narrated. This cupola was octagonal, and greatly admired by Michael Angelo. "Its architecture," says Theodore Ducas, "is rather Roman than Grecian or Gothic. It has arches, which the Grecian



BRONZE GATE IN THE BAPTISTERY OF ST. JOHN'S, FLORENCE.

style had not; and it has none of the fretted roofs and spiral form that distinguish the Gothic. It is a building of simple, unostentatious strength; and it would have an appearance of perfect grandeur, were the form of the dome circular and not octagonal." It exceeds the cupola of the Vatican, both in height and circumference, by four braccia; and although supported by eight ribs only, which render it much lighter than that of the Vatican, which has sixteen flanking buttresses, it is nevertheless more solid and firm. Thus it has never required to be supported by circling hoops of iron, nor has it demanded the labour of the many engineers who have printed volumes of controversies on the subject.* Vasari says of Brunelleschi that he had so completely mastered the science of architecture, that he became capable of entirely reconstructing the city in his imagination, and of beholding Rome as she had been before she was ruined. Cosmo di Medici, the generous and enlightened patron of Brunelleschi, in a letter addressed by him to Pope Eugenius IV., speaking of the merits of this extraordinary architect, said—"Holy father, I send you a person whose genius is so great that if Providence were to give him a chaos to arrange, he would execute the task." The skill displayed in this magnificent cupola was commemorated in the following inscription:—

"Tal sopra sasso sasso
Di giro in giro eternamente io strussi
Che così, passo passo
Alto girando, al ciel mi ricondussi."

As stone on stone I raised, as course on course
For evermore I piled; so tend my steps,
Face following pace, to my blest home in heaven.

Lorenzo Ghiberti was born in 1381, and died in 1455; and, in common with most of the great masters of his age, passed his early youth in acquiring the art of the goldsmith. He sculptured in bronze, gold, and silver. The two brazen gates he executed in the baptistry of St. John's, at Florence, are prodigies of genius, and have never been surpassed. The one represents the history of the Old Testament; the other, the principal acts of our Saviour's life. Besides the beauty of the historical subjects in the panels, the architraves and friezes of those gates are of exquisite design, containing flowers, fruits, plants, and animals, so perfect that they seem to have been cast from nature. Ghiberti had the soul of a poet; and, in vividness of imagination, refined taste, and unerring judgment, these masterpieces of sculpture may fairly challenge comparison with the Homeric shield of Achilles. When the Florentine authorities and the guild of merchants determined on constructing the two gates, which were to be similar to those which Andrea Pisano had executed for the first door, all the artists in Italy were publicly invited to the competition, and many foreign artists presented themselves to the syndics of the guild. Seven were selected—three Florentines and four Tuscans; each received a sum of money in advance, and was required, within a year, to produce a model in bronze as a specimen of his skill, all to be of the same size, which was that of one of the compartments in the first door. The subject chosen was the sacrifice of Isaac by his father Abraham. "This story," says Vasari, "comprised landscape, with human figures, nude and clothed, as well as those of animals; the foremost of these figures was to be in full-relief, the second in half-relief, and the third in half-relief." The competitors with Ghiberti were the most eminent masters of the day: they were Filippo Brunelleschi, Donatello, and Lorenzo di Bartoluccio, who were Florentines; with Jacopo della Quercia, of Siena, Nicolo d'Arrezzo, his disciple, Francesco di Valdambrina, and Simone di Colle, called Simon of the Bronzes. The model of Ghiberti was selected; and to the honour of Brunelleschi and Donatello, both those eminent masters confessed themselves fairly vanquished in the contest. They declared that envy alone could deprive him of the preference. His biographer says of this model—"The whole work was admirably designed, and very finely composed; the figures graceful, elegant, and in beautiful attitudes; and all was finished with so much care, and to such perfection, that the work seemed not to have been cast and polished with instruments of iron, but looked rather as though they had been blown with the breath." In the Crystal Palace is a copy of the gate† which records the Old Testament narrative, and without affirming that it is the finest specimen contained within its walls, it may with truth be said that this object alone will amply repay a

visit to Sydenham. Any abridged description of this marvel of genius would be mutilation; we shall therefore transfer to our pages the criticism of Vasari, who has delineated the whole with the enthusiasm of an artist.

"The folds of this door are adorned with stories from the Old Testament. The first presents the creation of Adam, and Eve, his wife, whose figures exhibit the perfection of beauty; and here we perceive that Lorenzo has had it at heart to give them the most exquisite forms that he could devise, intending to show that as our first parents came from the hand of God, the most beautiful of all the creatures that had been made, so in his work they were designed to surpass all the others that he had ever produced in any of his works—without doubt a most worthy consideration. In the same picture are seen our first parents eating the apple, and also at the moment when they are driven out of Paradise: and here the attitudes of the figures express the first effects of their sin—they are made aware of their nakedness, which they seek to conceal. We finally see them receive their punishment, being compelled by the angel to depart from Paradise.

"In the second compartment are Adam and Eve, with their two little children, Cain and Abel. These last are also shown when Abel is offering the best of his flock in sacrifice, while Cain presents the less worthy oblation. The expression of the latter displays his envy of his brother—that of Abel makes manifest the love he bears to God. One part of this picture is of singular beauty, it exhibits Cain ploughing the earth with a pair of oxen, whose labour, and the efforts they make beneath the yoke, are so admirably exhibited that they seem alive, and in positive motion. The same may be said of the figure of Abel, who is keeping his flocks: he is then slain by his brother, and here the movements of Cain are full of violence, his expression is that of pitiless cruelty, as he strikes his brother with his club, while the bronze itself has been made to exhibit the languor of death in the most beautiful form of Abel. In the distance, moreover, and executed in basso-relievo, is seen the Almighty Father, demanding from Cain what he has done with his brother. Each of the compartments comprise four stories. In the third Lorenzo represents the patriarch Noah issuing from the ark with his wife, his sons, his daughters, and the wives of his sons, together with all the animals, those of the air as well as of the earth: all these creatures are finished with such perfection of excellence, each in its kind, that it is not possible for art more effectually to imitate nature. The open ark is seen in the extreme distance, with the desolation caused by the Deluge; this part is in perspective, and in the lowest relief (bassissimo-relievo), the whole being treated with the utmost delicacy: the figures of Noah and his sons could not possibly be more full of life, as they offer their sacrifice to God, while the rainbow, the sign of peace between God and Noah, is seen in the heavens. But much the most admirable of all is the scene where Noah has planted the vine, and having drunk of the fruit thereof has become inebriated, and is exposed to the derision of Ham, his son. And of a truth no sleeping figure could be more exactly imitated, the utter abandonment of the intoxicated limbs is finely rendered, the love and consideration exhibited by the other sons of Noah are equally well expressed, and the attitudes of the latter are beautiful. The vine, the cask, with all the requisites of the vintage, are moreover exhibited; but all are treated with so much judgment that they do not impede the action of the story, but on the contrary, increase its force and give it most appropriate ornament. For the fourth story of this compartment Lorenzo has chosen the appearance of the three angels in the valley of Mamre, and the intended sacrifice of Isaac. These figures have a close resemblance to each other; the holy patriarch is seen in the act of adoration before his celestial visitors, his hands are folded, and the expression of his countenance is most life-like and appropriate. The servants with the ass, who are represented as awaiting Abraham at the foot of the mountain, whither he has gone to make the sacrifice of his son, are equally excellent. Isaac stands naked on the altar, while the father, with upraised arm, is in the act of proving his obedience, when he is prevented by the angel, who arrests his arm with one hand, while he points with the other to the animal which he is to offer in sacrifice, and thus delivers Isaac from death. This story is of a truth exceedingly beautiful; and among other matters worthy of observation, is the great difference between the delicate limbs of Isaac and those of the more robust servants, inasmuch that there does not seem to have been a touch given which had not been calculated with

* Note in Bohn's Edition of Vasari, vol. i. p. 448.
† See Engraving, p. 69.

the nicest exactitude and the most perfect knowledge of art. In the difficult matter of representing the buildings, Lorenzo appears to have surpassed himself in this work. The birth of Isaac's sons, Esau and Jacob, with the chase of the former, at the desire of his father, form the subjects of the fifth story. Jacob, conducted by Rebecca, is offering the prepared kid, the skin of which his mother has wrapped around his throat, while Isaac stretches out his hands towards him, and bestows the benediction: all these things are admirably represented. There are, besides, many beautiful dogs in this picture; and the figures of Isaac, of Jacob, and of Rebecca, exhibit precisely the effect produced in actual life.

"Animated and exalted by the study of his art, its difficulties became daily more familiar to the master, and presented less formidable obstacles to his efforts, inasmuch that he was constantly emboldened to new enterprises. His sixth compartment represents Joseph cast by his brethren into the well, and also his deliverance therefrom by the merchants, by whom he is presented to Pharaoh; the interpretation of Pharaoh's dream is likewise exhibited, with the precautions taken to provide for the years of famine, and the honours rendered to Joseph by Pharaoh. Then follows the patriarch Jacob dispatching his sons into Egypt for the purpose of buying corn, where, being recognised by Joseph, he causes them to return to their father. In this story, Lorenzo displayed his mastery over the difficulties of perspective in a circular temple, which is one of the objects; there are, besides, various figures differently occupied in loading corn and meal, with asses, which are also most naturally represented. The feast given by Joseph to his brethren, the concealment of the gold cup in the sack of Benjamin, its discovery, with the return of the travellers to Joseph, who makes himself known to and embraces his brethren—all these things are here shown; and this story, for the varied passions and affections portrayed in it, as well as for the many rich accessories, is considered to be the most remarkable, difficult, and beautiful of the whole work.

"But Lorenzo was, of a truth, endowed with so fine a genius, and possessed so peculiar a grace in the execution of the figures here described, that when his mind became occupied in the composition of a beautiful story, he could not well do otherwise than produce exquisite forms; and this we may infer from the seventh compartment, which represents Mount Sinai, with Moses on the summit, receiving the laws from God, and kneeling in adoration, with the appropriate expression of reverence; midway up the mountain is Joshua, who is awaiting the return of Moses, and the assembled people are gathered at the foot of the Mount, terrified by the thunders, lightnings, and earthquakes, and exhibiting an infinite variety of attitude, all represented with the utmost truth and nature. The master has also shown great love and diligence in the eighth compartment, wherein he has portrayed Joshua proceeding against Jericho, and causing the river Jordan to flow backwards. He has here represented twelve tents, for the twelve tribes, all full of highly animated figures; and still more beautiful are some others, in basso-relievo, who are proceeding with the ark around the walls of the aforesaid city, when those walls are overthrown at the sound of the trumpets, and Jericho is taken by the Hebrews. In this picture the relief of the landscape is gradually lowered, so that the distance is increased with great judgment, and the true proportions of the first figures to the mountains, with those of the mountains to the city, and of the city to the distant country, are observed with infinite care—the degrees of relief being regulated with the nicest judgment, and the whole work conducted to the utmost perfection: the experience of the master, and his power in his art, increasing from day to day. In the ninth picture he has represented the giant Goliath, with David, in a proud yet child-like attitude, who cuts off the Philistine's head, when the army of God destroys that of the pagan. Here the artist has represented horses, chariots, and all the other accessories appertaining to war. In another part is seen David returning with the head of Goliath in his hand, and received by the people, who meet him with songs and the sound of instruments, all portrayed with perfect truth, and full of animation. There now remained for Lorenzo to put forth all his strength for the tenth and last picture, where the Queen of Sheba, with a splendid retinue, pays her visit to King Solomon. Here there is a building drawn in perspective, and exceedingly fine, with a variety of figures similar to those in the previous stories. Nor less carefully and perfectly executed are the decorations of the architraves, and the framework surrounding these doors, among

which are fruits and festoons of foliage finished with the accustomed excellence of the master."

In this work, whether taken in detail or considered as a whole, we have proof of the wonders that may be accomplished by the fertile invention and practised ability of the sculptor, whether in full-relief, half-relief, or in the low and lowest relief; the effect he may produce in the composition of his work by the disposition of his figures, and by variety of attitude in male and female forms; the rich effects to be derived from the judicious introduction of buildings, and due attention to the laws of perspective; with the grace that results from each according to their appropriate expression to either sex, and to the different ages, as we see done in this work, where in the old we admire gravity, and in the young their beauty and graceful lightness. Wherefore it may be truly affirmed that this gate is in all respects perfect, and is the most admirable production that has ever been seen in the world, whether ancient or modern. The justice of the praises bestowed on Lorenzo may be inferred from the words of Michael Angelo Buonarroti, who, standing to look at these doors, and being asked what he thought of them, and whether they were beautiful, replied in these words:—"They are so beautiful, that they might fittingly stand at the gates of Paradise"—a truly appropriate tribute, and offered by him who could well judge of the work. Well, indeed, might Lorenzo complete his undertaking successfully, for he laboured with a patience and industry more than extreme, and beyond the power of words to express.

Ghiberti was only twenty years of age when he commenced the first door, and on the two he expended forty years of labour. His industry never wearied, for he executed many other works, all of surpassing excellence in design, and most exquisitely finished. He could turn his hand with facility to every department of his art. He painted beautifully on glass. Giovanni, son of Cosmo de Medici, ordered him to surround a large cornelian—in which the slaying of Marsyas by Apollo was represented in intaglio—with a gold ornament; and this commission Ghiberti executed with so much skill, that the ornament rivalled the engraving on the stone itself, which was perfect. The golden mitre which he made for Pope Eugenius, in 1438, was the theme of universal admiration. To this extraordinary man may be applied the epitaph that Dr. Johnson wrote on Goldsmith—"He adorned everything he touched;" and no production of the sixteenth century, so highly and justly praised for its prodigies in ART, cast his transcendent merits into the shade.

The Florentine sculptor, Donato, or Donatello, is another of the leading celebrities of this epoch. He was born in 1386, and died in 1468. His works were very numerous. He, Ghiberti, and Brunelleschi, formed the illustrious triumvirate of the second Renaissance period: his figures are remarkable for freedom of movement and energy of expression; and he is considered the first, in order of date, who distinguished himself as a consummate master of basso-relievo in historical compositions. For the Church of Santa Maria del Fiore, at Florence, he executed those figures in the decorative parts of the organ loft, of which Vasari observes, that a spectator looking at them "almost believes them really to live and move." He produced the statue of St. Peter, which stood in the Or San Michele, which building was completed at the expense of the guilds, or civic trades, of Florence. These institutions were generous patrons of art: his figure of St. George in his armour, reproduced in the Crystal Palace, was executed for the guild of armourers. Vasari declares that it excelled every modern figure. "Life," he observes, "seems to move within that stone." In the Crystal Palace is a copy of his bronze "David,"* which originally stood in the Medici Palace. It is nude, and of the size of life. The Hebrew warrior has his raised foot pressing on the head of Goliath; in his right hand he holds the sword of the slain giant, and in the left a stone. The expression of the face is thoughtful rather than triumphant, indicating that the conqueror was conscious to whom the victory was due. The picturesque cap and flowing hair are very graceful. Donatello executed another "David" in marble, in which the warrior holds in his hand the sling from which he discharged the stone that slew the Philistine. The Renaissance Court also contains a figure of St. John the Baptist,* by this artist, originally executed in wood with great study and care, and which he gave to the Church of the Friars Minor, at Florence: it is in the side next to the central tran-

* See Engravings, p. 72.

sept. In the interior of the Court is a Virgin and Child, which Donatello executed for Cosmo di Medici, and displays to advantage the soft and pure style of the master. This we have also engraved. The statues of Donatello adorned Florence and Padua. He is considered the precursor to Michael Angelo, in that imposing solemnity of effect which the latter carried to perfection.

To the list of architects of this period we must add the name of Leon Batista Alberti, born in 1404, and who died in 1472. He is distinguished as the first in the Renaissance period who wrote a book on architecture, even before the work of Vitruvius was discovered, which is to this day a text-book for the student. Alberti was the principal adviser of Pope Nicolas V., in the various and important improvements which that pontiff effected in Rome. He designed the Church of San Francesco, at Rimini, one of the finest ornaments of Italy, at the desire of Sigismondo Malatesta.

Among the painters of the second epoch, Paolo Ucello is celebrated for the improvements he introduced in the study and practice of perspective. He was born in 1396, and died in 1479. Vasari awards but faint praise to his drawing and his painting; but confesses that his "figures really seem standing on

marbles. Theodore Deucas has pronounced the following criticism on his works: "The air of his heads is quite in the style which Raffaello afterwards perfected. His countenances have much expression; there nature shines in all her grace, animation, and variety; his draperies, disdaining the dry minutiae of his time, appear in few and natural folds; his colouring is true, varied, and harmonious. He is looked upon as the earliest modern painter who made the parts of his picture subordinate to the general principle of the whole. He was a man of real genius; his mind was full of ideas, whether created or adopted; he selected the beauties of other artists, and, too judicious to fall into a blind admiration of the antique, he improved as well as imitated. His works formed the school of the best Florentine painters, and the degree of approximation to his excellence was the measure of reputation. It has been shown that Raffaello himself learnt much from the works of Massaccio; and Michael Angelo, when a young man, studied his frescoes in the Church of the Carmelites, at Florence." In the foreshortening of his figures, and in the treatment of the nude form, Massaccio exceeded all former artists. Vasari speaks in admiration of the coved ceiling, painted in perspective, and divided into square compartments, in the Church of Santa Maria Novella, in Florence, executed by Massaccio, where "the foreshortening is managed with so much ability, and the whole is so judiciously treated, that the surface has all the appearance of being perforated." Before his time, the figures of men and women were so painted as to appear standing on the points of their feet; Massaccio planted them firmly on the plane they occupy, and before Ucello developed his method. In his picture representing St. Peter administering

the plane whereon they are placed," and that he showed by fixed rules how the figures, in order manifestly to draw back or retire, must gradually be diminished, of which method earlier artists were ignorant. "He also discovered the method of turning the arches, and of cross-vaulting the ceilings; taught how floors are to be foreshortened by the convergence of the beams; showed how the artist must proceed to represent columns bending round the sharp corners of a building, so that when drawn in perspective they efface the angle, and cause it to seem level." The methods that Ucello adopted were eminently serviceable to those who followed him; and in that department of Art to which he devoted himself, he must be considered one of the most useful pioneers of progress.

Massaccio was born in 1402, and died in 1428. His real name was Tomaso de San Giovanni, but, on account of his carelessness in dress and manner, he was called Massaccio. He united all the excellences of his predecessors. From a study of the works of Ghiberti and Donatello he derived his knowledge of the general principles of imitative art; from Brunelleschi he learned perspective. At Rome he polished his style of design by a careful contemplation of the ancient



VIRGIN AND CHILD.



DAVID.



JOHN THE BAPTIST







the rite of baptism, the figure of a naked youth, shivering with cold, was deemed a masterpiece, and is said to have created a new epoch in art. It was painted in the Brancacci Palace, with many other scriptural subjects, and Vasari enumerates a long list of artists who went to study those admirable productions. This highly talented man died in the flower of his age, being only twenty-six years old. Some enthusiastic friend wrote the following epitaph on his tomb, in the Church of the Carmine, where he lies buried:—

"If any seek the marble, or my name,
This church shall be the marble, and the name
Yon oratory holds it. NATURE envied
My pencil's power, as ART required and loved it,
Thence was it that I died."

Another may be here recorded, as containing a just appreciation of his highly-gifted genius:—

"I painted, and my pictures were as life;
Spirit and movement to my forms I gave,—
I gave them soul and being. He who taught
All others—Michael Angelo—I taught:
He deigned to learn of me."

Oil colours in paintings were known in very early times, but the period fixed upon when they were commonly used is in the fifteenth century. As to the precise date, the historians of art differ. Giovanni Van Eyck, otherwise called John of Bruges, was a chemist as well as a painter, and anxious to retain colours in their original lightness, he experimented with linseed-oil, and was successful. Before this discovery, the only mode of colouring was in distemper. When Antonello of Messina heard of it, he went to Flanders, where Van Eyck taught him the new method. With this knowledge Antonello repaired to Venice, and communicated the secret to Domenico Veneziano, who imparted it to Andrea del Castagno, when he established himself in Florence. Andrea, envious and ungrateful, and desirous of monopolizing the new process, basely assassinated his friend. He was not suspected of the crime during his life, but on his death-bed conscience extorted a confession.

Alessio Baldovinetti, born in 1422, and who died in 1499, executed a Nativity of Christ in the Church of the Annunziata, in Florence, "In which," says Vasari, "each separate straw on the roof of a cabin figured therein may be counted, and every knot in those straws may be distinguished." This is the earliest and most beautiful specimen of extreme minuteness. This master also excelled in mosaic.

Fra Filippo Lippi, a Carmelite monk, was born in Florence in 1412, and died in 1469. He was an admirable painter, and is here noticed because he made his figures larger than life; for though some of the earliest masters had adopted the same method, yet none before him had succeeded in imparting to it grandeur of style. In this respect Lippi was the teacher of future artists.

Domenico Ghirlandajo, whom Theodore Ducas designates the last of the masters of the old Florentine school, was born in 1449, and died in 1498. The same writer says that he used colours to express those parts of his subject which the art of the goldsmith or of the embosser was generally called upon to describe, and that he was one of the earliest painters who threw passion and mind into his portraits. Ducas pretends that he was called Ghirlandajo from his favourite practice of adorning the heads of women and children with garlands; but this seems to be an error, as his father's name was Tomaso del Ghirlandajo, because he sold garlands, or was the son of a man that sold garlands. Vasari, however, says that he was a goldsmith. Domenico is considered to be the first artist who painted a figure wearing spectacles. He had an eye so accurate that he is said to have drawn the likenesses of all who passed by his workshop, in which the resemblance was perfect. His biographer

states that when making drawings from the various antiquities of Rome, he never used rule or compass, but depended on his eye alone. "He drew the Coliseum in this manner, placing a figure standing upright in the drawing, by measuring which all the proportions of all the building will be found; this was tried by the masters after Domenico's death, and found to be rigidly correct." He executed an Annunciation in mosaic, in which style he excelled, and to which he was warmly attached; for he was wont to say "that painting was design, but that the true painting for eternity was mosaic. The works of this master were numerous, and among his pupils was the illustrious Michael Angelo.

Andrea Verrochio, born at Florence in 1432, and who died in 1488, was possessed of such versatile talents, and of such untiring industry, that he was eminent in painting, sculpture, and architecture. He was also an excellent geometrician, and very skilful in the figures of animals, in garlands of flowers, and in all those tasteful decorations of fancy which were usually wrought by goldsmiths. In the Renaissance Court, in the side next to the central transept, is a copy of one of Verrochio's most beautiful productions. It is the figure of a bronze Cupid strangling a fish, originally placed on a fountain at the Villa of Caveggi, belonging to Lorenzo di Medici. He executed a similar design, only changing the Cupid for a boy, which Vasari says "is a truly admirable figure." His erudite and judicious translator, Mrs. Jonathan Foster, observes, "It is impossible to imagine anything more life-like than the expression and action of the boy, as he presses the struggling creature, from whose nostrils water is gushing, to his breast." Verrochio was a pupil of the celebrated Donatello; and among his disciples were Pietro Perugino, and the wonderful Leonardo da Vinci.

Pietro Perugino was born in 1446, and died in 1524. His family name was Vanucci, but whether from having been in Perugia, or sent to it at an early age, he was called Perugino. He struggled to fame and fortune from the depths of poverty, and against all the disadvantages which poverty entails; and has the high honour of being the instructor of the famous Raffaello d'Urbino, who worked with him during many years. In the Crystal Palace are several reproductions from one of his greatest works, the Hall of Audience in the Exchange of Perugia. There Perugino decorated the ceilings with the seven planets, united with the twelve signs of the Zodiac. Fanciful decorations of this character may be traced to a very remote date; but they were rather astrological than astronomical,

arising out of the curious conceit that the planets had what were called their thrones, exaltations, and houses, in the zodiacal constellations. The ceiling of the Hall of Audience had several compartments. On the wall opposite to the entrance door was depicted the Birth and Transfiguration of Christ; and on panel, St. John and the other saints. On the side walls of this building were represented Greeks, Romans, and Jews—as Leonidas and Socrates, Trajan and Numa Pompilius, Isaiah and Daniel. Then came the Sybils, and representations of the priests and priestesses of the old Lybian and Delphic oracles. A severe taste may condemn such an incongruous mixture, and, moreover, such characters are not in their right place on the walls of a commercial exchange; nevertheless, this historical *tableau* is deemed admirable as a work of art. An Italian critic has declared that "The Hall of the Exchange is to the fame of Pietro Perugino, as are the Stanze of the Vatican to that of Raffaello."

In that side of the Renaissance Court which is nearest the central transept, is a reproduction of the marble doorway from the Doria Palace, at Genoa, the work of Perino del Vaga. This artist was born in 1500, and died in 1547. Vasari considers him to have been "One of the most extensively endowed and versatile painters of the age."



CUPID STRANGLING A FISH.

of John's head to Herodias by his daughter. There are others of an historical character, one of the most remarkable of which recounts the more memorable events in the life of St. Ambrose, Bishop of Milan. He is seen in infancy, lying in his cradle, when bees settle on his face and enter his mouth, without doing him any injury—a presage of his eloquence, as in the case of Plato, of whom the same story is told. In another panel he receives episcopal consecration. His courage is shown in the fifth panel, where he forbids the entrance of the Emperor Theodosius into the Temple, whom he had publicly anathematized. We next see the same emperor doing penance to the bishop, denoting the ascendancy of spiritual over temporal power.

In the central panels, Galeazzo himself appears laying the foundation stone of the Certosa, which the primate of Milan sprinkles with holy water. The ceremonials attending the event are described in the next panel, in which appears the model of the building carried by a body of labourers, escorted by a cavalcade. The architect points to the spot where it is to be deposited. Our engraving is one selected from these various groups: the lower compartment is devoted to piety, symbolised by the Virgin and Child; the upper represents a battle scene—a charge of cavalry, and the assault on a fortress.

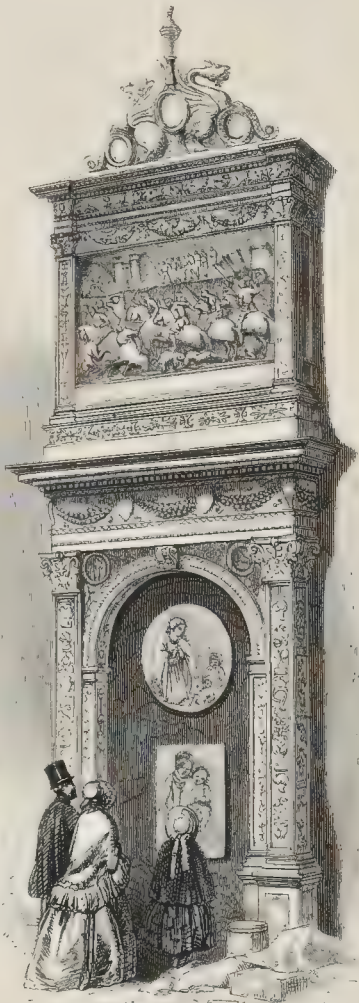
The object of those who constructed and arranged the Renaissance Court has evidently been to collect within it as many reproductions as possible of varied style, and in this they have succeeded; but it may fairly be objected that this plan necessarily reduces those reproductions to a fragmentary character. We can form a clear judgment of Ghiberti's wondrous door, for it presents itself to us as a whole, but we have not any complete notion of the Certosa of Pavia, which is exhibited in detached portions. We derive unmixed satisfaction from contemplating entire statues, but when columns and pilasters are brought before us, separated from the buildings to which they belong, however attractive they may be in themselves, they give us no idea of the relation in which they stand to the structure of which they form a part: "ex pede Herculem," is indeed an old rule, but it is nothing more than an alternative, and we desire the presence of the whole figure. However, the constructors of the Renaissance Court had to struggle against an unconquerable difficulty—want of space; and they deserve every praise for what they have accomplished within so limited an area.

The Renaissance period in England is illustrated by the Elizabethan Court, of which the façades and arcades are taken from the exterior of Holland House, Kensington, erected in 1607. The

Elizabethan style is peculiarly English, distinctive and characteristic, and harmonizes most beautifully with our rural scenery. As specimens of this form of architecture we may refer to the tombs of Henry VII., Queen Elizabeth, and Mary, Queen of Scotland, in Westminster Abbey; among private residences, to Longleat House, Wollaton Hall, and Audley End. This style has been ably described by a recent writer with clearness and fulness:—

"The peculiar system which has obtained the generic title of

Elizabethan prevailed during part of the reign of the house of Tudor, which gave its name to the edifices preceding, and intimately connecting with Gothic art those called after the virgin queen. This latter was exclusively used in secular edifices; it is a very mixed style, presenting a combination of Roman, Gothic, and Tudor details, fused together with much skill and great picturesqueness of general effect. The plans, the main outlines, and the mode of decoration adopted—its very irregularity, rendered it alike suitable to the lowly cottage and the stately baronial hall. The proportions of the Roman orders were set aside; a new series, combining portions of the old with all manner of fantastic devices, were invented, and were more generally used as decorative accessories than as means of support. Columns were grouped together, placed one above another to the exhaustion of the orders, and sometimes twisted into peculiar forms, covered with bands, arabesques, and other decorations. These were usually elevated on panelled pedestals, the entablatures continually broken, and the mouldings so confused, that the distinctions between architraves, frieze, and cornice, are frequently lost in the richness of the total mass. Pediments of every conceivable shape were introduced; the dormers are exceedingly picturesque, and niches were occasionally used. The porches and doorways are curiously carved; no tracery is visible in the windows, but mullions are retained, and the bays and oriels are very effective features. Gables, also, of convex and concave curves, and differing from one another in the same front, were in constant requisition, together with elaborate stone parapets, sometimes solid, but usually pierced in scrolls and curves of capricious shapes, and decorated with rich finials, balls, obelisks,



PILASTER FROM THE MONUMENT OF GALEAZZO VISCONTI.

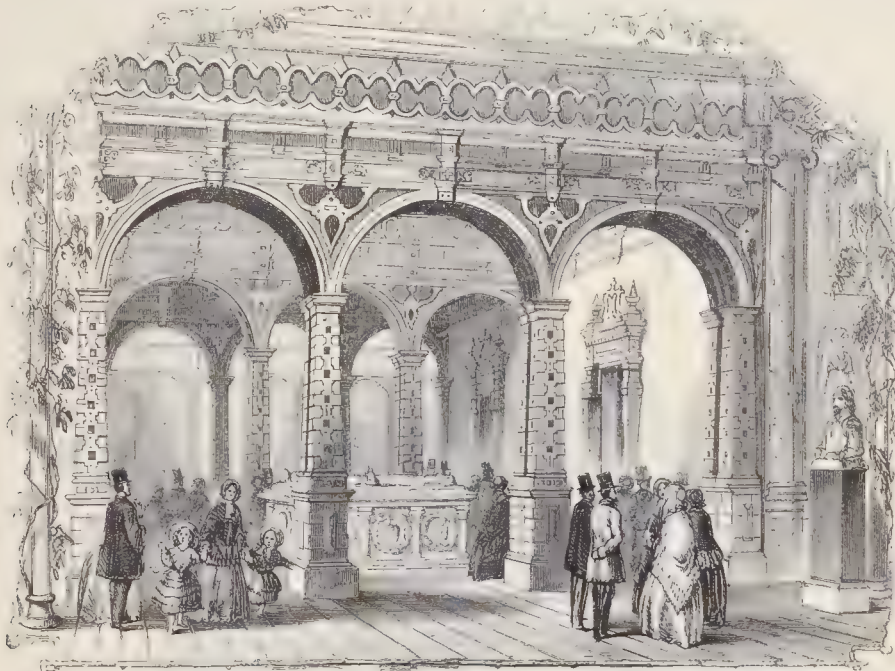
and statues, pinnacles, angle turrets, and glittering vanes, all of endlessly diversified design; and, above all, crowning the edifice, rose the picturesque lines of the roofs, and the richly clustered chimney shafts. The 'trim gardens,' so precisely laid out, with their lordly terraces, their bowers, and trellis walks, their broad flights of steps, and fanciful balustrades, the rarely absent bowling-green, and the bright profusion of shrubs, trees, and flowers,

admirably harmonised with the generally predominant red colour of the mansion they surrounded. Similar characteristics prevailed within. The hall is usually a very extensive apartment, with implements and trophies of the chase hung upon the walls. Capacious staircases, the balustrades of which are wonderfully varied in design, lead to the upper floors; and the rooms are usually wainscoted, the ceilings richly panelled, and the chimney-pieces very large and elaborate. Although simplicity is entirely banished from Elizabethan architecture, and it can never rank very high, there is such an air of old-fashioned dignity and quaint magnificence, such a fantastic irregularity and gorgeous picturesqueness of general effect, that, what with their merits and their historical associations, these playful associations will probably ever continue to be favourites in the land.*

On entering the Elizabethan Court from the gallery, we behold a copy of the monument of Sir John Cheney, the original of which stands in Salisbury Cathedral. He was a brave knight in the

who died in 1522. Patronized in his youth by Lorenzo di Medici the Magnificent, in whose celebrated gardens he studied the fine models of antiquity, with Michael Angelo and other young men who afterwards became famous, he soon displayed a most envious spirit and irritable temper. In a moment of anger and jealousy he struck Michael Angelo with such violence on the nose with his clenched fist, that, as he himself says, he felt "the bones and cartilage craunch under his hand as if they had been thin biscuit." Lorenzo was indignant at this outrage, and Torrigiano was compelled to flee from Florence. He afterwards served with distinction as a soldier, and then went to England, where his gains were large as a sculptor. His principal work in this country is the bronze monument of King Henry VII. and of his queen, in the chapel in Westminster Abbey, called after the name of that monarch. Torrigiano died in Spain, in the dungeons of the Inquisition.

In the Court of Christian Art, adjoining the great central transept, and which is an appendage to the Renaissance Court, is a fine



FACADE OF THE ELIZABETHAN COURT.

wars of the Roses, and distinguished himself in the decisive battle at Bosworth, where he fought on the side of the Lancastrians. His statue is in alabaster, and represents the old warrior in complete armour, decorated with the Garter and the Lancastrian Collar.

In a recumbent posture lies the marble effigy of the unfortunate Mary, Queen of Scotland, erected by the piety of James I. to the memory of his persecuted mother. Her monument is in Westminster Abbey. The face is a portrait. Near to her is the imperious Elizabeth, who brought her to the block. This figure is also in marble, and the countenance denotes that the artist intended to represent her at an advanced period of life. The well-known costume of the period, seen on all her paintings and prints, is well preserved by the stiff bodice and the ample frill. Lions support her feet. The sceptre in one hand, the globe in another, proclaim her regal dignity. On the following page we have engraved these two figures, with a bust of Shakspeare at their feet.

The tombs of Henry VII. and of the Countess of Richmond are the work of the Italian sculptor Torrigiano, born in 1470, and

equestrian statue of Erasmo da Narni, generally known by the name of Gattamelata. He was a famous captain of those Italian mercenaries called *condottieri*, who sold their swords to the best bidder, without regard to the justice of the cause in which they were engaged. Gattamelata served the Venetian Republic; and the Signoria of Venice erected this monument to his honour. It was executed by Donatello, who took for his model the celebrated statue of the Roman emperor, Marcus Aurelius, which stands in the middle of the piazza of the Capitol. The horse on which the emperor is seated was of bronze, and so excellent that Michael Angelo, on first seeing it, exclaimed, "Go on, then!" Some have pronounced this statue the masterpiece of Donatello, and, indeed, the anatomy is perfect. With the exception of the head and arms, Gattamelata is fully armed; not so the horse, which only has an ornamented saddle and girth. The head of the rider is a copy from life. He is clothed in Milan mail; and his armour and that of his horse are still preserved in the arsenal of Venice.

This section of the Renaissance Court is not so complete as the directors intended. They were desirous of obtaining from Padua the series of bronzes, executed by Donatello, in the Church of

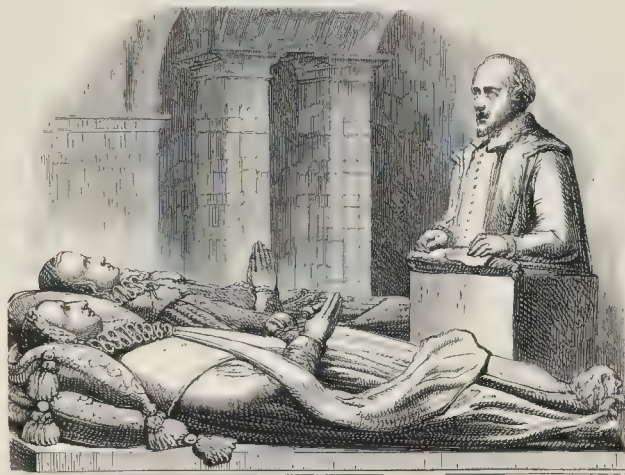
* A Popular Account of Styles of Architecture. By Edward L. Tarbuck.

St. Antonio, in that city, but the ecclesiastical authorities refused their permission. It is only an act of justice to Cardinal Wiseman to state that he used his influence to promote the wishes of the Directors, but failed to remove the illiberal and narrow-minded obstinacy he had to encounter. Whether this resistance to diffusing a knowledge of the treasures of art was inspired by a love of monopoly, an envious jealousy, or the hatred of an heretical people, does not appear, for no reasons seem to have been assigned; but it certainly does not redound to the credit of Padua. However, with this diminution of what might have been added to its treasures, the Renaissance Court is one of the most attractive and instructive departments in the Crystal Palace, and repeated visits will not diminish its interest so long as the gates of Ghiberti remain.

Of late years, a certain class of critics have pronounced withering censures on the Renaissance style. These writers travel from "Dan to Beersheba, and fud it all barren." Whether the violent and unqualified vituperation in which those gentleman have indulged has arisen from capriciousness, affectation, or a morbid love of eccentricity, it were waste of time to inquire; but there can be no doubt that it manifests an utter want both of fairness and judgment to pronounce indiscriminate condemnation on the productions of a whole epoch. Each style should be judged by its own standard. In obedience to the law of progress, man advances from bad to better, and those who come latest into the field have models on which to improve themselves, which their predecessors did not possess. It is wise to compare styles with styles, and note the characteristics of each; but it is wrong to oppose styles to styles for the paltry purpose of instituting invidious comparisons. Granting that Michael Angelo was the prince of sculptors, are we to deny all merit to

Donatello? What estimate should we form of that man's intellect who refused to a Telford the title of a civil engineer, because his admirable earthroads, smooth as a bowling-green, are inferior to the railroads constructed by a Stephenson?

"What to observe and how to observe," in the Renaissance Court, may admit of a few hints. The Renaissance and the Italian Courts, having been studied separately, should then be compared together as parts of one connected whole, by which method a comprehensive view will be taken of the rise, the advancement, and the perfection of art. We shall thus trace its progress step by step—its struggles, failures, and final triumph—and attain to critical knowledge. It should be remembered that the earliest artists of the Renaissance did not possess those antique models which proved of such inestimable value to their successors. In apportioning merit, justice requires that we should weigh the means by which the end is attained. Where the means are ample, we are entitled to expect large results; where they are small, we ought to be satisfied with minor performances. The history of art is a continuity. Some dig the foundations; others build the walls; a third generation construct the roofs and superstructure; and praise is due to all who well perform their share of the work. We should not forget the pioneers, who fell and clear the forest, while we admire the architect who, at a later date, rears up palatial edifices. To each his due: let us remember Cimabue and Giotto, while we are lavishing our praises on Da Vinci and Raffaello; and let each epoch be tested by its opportunities and capabilities. This method of arriving at sound conclusions is the only one that impartial justice will sanction, whatever the cant of criticism may aver to the contrary.

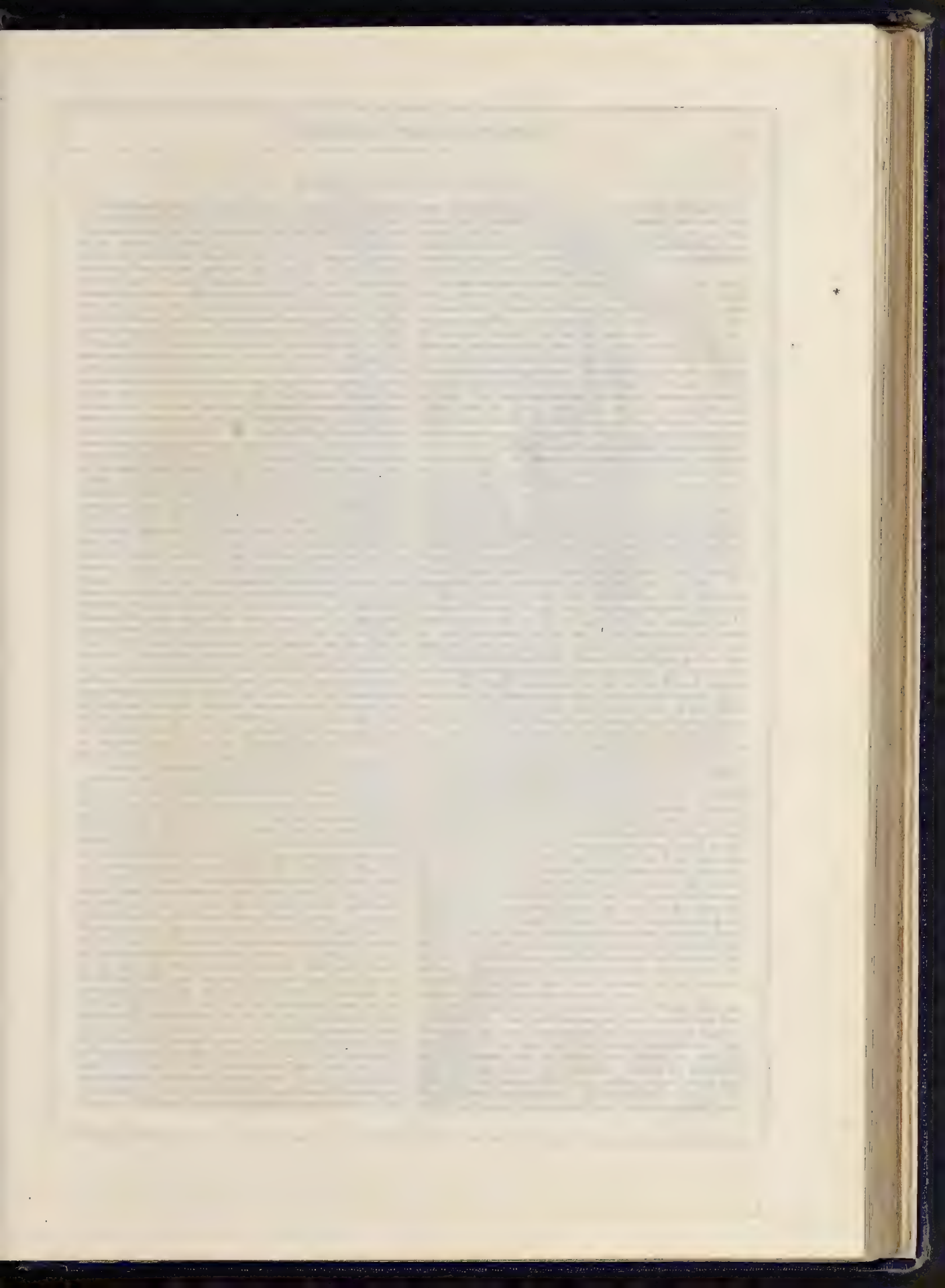


MARY AND ELIZABETH.

SHAKSPERE.









THE ITALIAN COURT.

THE sixteenth century is one of the most strongly marked epochs in the history of European civilisation. It not only perfected what the preceding age had left incomplete, but achieved new conquests in art, science, and learning. It is the era of the Reformation, which, by establishing the right of private judgment, secured religious freedom, and prepared the way for political liberty. Printing gave wings to knowledge; and successful navigators, discovering a new world, extended the sphere of industry, adventure, and colonisation. Ancient literature was diligently cultivated, and its profound study invigorated the human intellect. Erudite Greeks, who had fled from the tyranny of the Mahometans after the capture of Constantinople, found a hospitable refuge in Italy, and there unfolded the treasures of ancient wisdom. Manuscripts were sought after with increased ardour; and the liberality of the popes conferred wealth and honours on those who exhumed a buried statue, or rescued an old book from the dust and damp of the monasteries. It is true that this intellectual movement had commenced at an earlier date, with which the names of Petrarch, Dante, and Boccaccio, are associated: and their illustrious works will ever consecrate the epoch in which they flourished. But while every merit is due to the age of Cosmo and Lorenzo di Medici, the patrons of the early Renaissance, and of those gifted men whose rising genius they trained and fostered, it must be acknowledged that matured excellence belongs to the sixteenth century. This, however, is not to be understood in a rigidly chronological sense, for it is not possible to draw a line to which objections may not be raised. Mr. Roscoe says that, "The most illustrious period of the arts is that which commences with the return of Michael Angelo from Rome to Florence, about the year 1500, and terminates with the death of Leo X., in 1521. Within this period, almost all the great works in painting, in sculpture, and in architecture, which have been the admiration of future ages, were produced. Under the successive but uninterrupted patronage of Julius II. and Leo X. the talents of the great artists then living were united in one simultaneous effort, and their rival productions may be considered as a joint tribute to the munificence of their patrons and the glory of the age." This criticism appears to us far too narrow and exclusive; the quarter of a century selected may rather be taken as the middle period of a term characterised by an intellectual and artistic movement which has left an indelible impression; and in estimating its civilising and elevating influences we cannot sever literature from art, as the mythological and historical subjects illustrated by the sculptors and painters show how powerfully they were influenced by the advancement of learning. Printing, therefore, forms a prominent feature in the annals of the Renaissance.

Milan and Venice contend for priority in introducing the typographic art into Italy. Theodore Ducas inclines to the opinion that the Germans, Conrad Sweynheym and Arnold Pannartz, who joined some of their countrymen in the monastery of Subiaco, in the Campagna di Roma, are entitled to the credit of carrying the new invention beyond the Alps; and their first book, a *Donatus*, issued from the Subiaco press in 1465. The two Germans then repaired to the house of Petrus de Maximis, in Rome. Printing-presses soon multiplied, and were established in every Italian city. Paolo Manuzio, or, as he is generally called Aldus, an admirable scholar and critic, established himself as a printer at Venice, and devoted his attention to the Greek and Roman classics. He took up his abode in Venice in the year 1488, and his first books were published in 1494. They were Musæus' poem of *Hero and Leander*, in Greek and Latin, and the *Greek Grammar* of Lascaris. Aldus formed a philological society at his house, which was frequented by most of the *literati* of Venice, among whom was the celebrated Erasmus. Aldus paid liberally for old manuscripts, and employed agents to search after literary treasures all over Italy. He was the first editor who collected and published the whole of the works of Aristotle in Greek, in five volumes folio; and the first, also, who conceived the idea of a Polyglot Bible, but he never advanced beyond his prospectus sheet. He was a great improver of types; and it is said that a manuscript of Petrarch's gave him the notion of the character that is generally called the Aldine, or Italic. An edition of *Virgil*, in the year 1501, was the earliest specimen of the new mode. In 1502, the senate of Venice secured to him the exclusive privilege of using this invention. In order to distinguish his books, Aldus decorated the first or last

page, and sometimes both, with an anchor, having a dolphin coiled round it. The solidity of the anchor denoted prudence; the dolphin was the ancient symbol of swiftness, for it was believed that the rapidity of its motion through water exceeded that of any other aquatic animal. The two symbols were taken from an ancient medal struck in honour of Titus Vespasian.

The first complete edition of a Greek classic ever printed, issued from a Florentine press in the year 1488. It was *Homer*, in two volumes folio. Demetrius Chalcondyles was the editor, Demetrius of Crete the printer; while Bernardo and Neri di Nerli, two noble Florentines, defrayed the cost of publication. Florence was, perhaps, the first city in Italy that printed without foreign aid. Her earliest printer was a native of the place; his name Bernardo Cennini, originally a goldsmith. He and his son cut the punches and cast the types, with which he printed a folio edition of *Virgil*, in 1471. This happened during the rule of Lorenzo di Medici. Under Cosmo di Medici, manuscripts had been eagerly gathered, and libraries formed. Niccolo Niccoli, a private citizen of Florence, had collected some eight hundred volumes of Greek, Roman, and oriental writers; and Theodore Ducas considers him the father of verbal criticism. He ruined his fortune in gratifying his literary tastes, and died insolvent. Cosmo paid his debts, and took possession of his books, which he deposited in the Dominican monastery of San Marco, at Florence, for public use.

Zacaria Caliergus printed several Greek authors at Venice, between 1499 and 1513, and afterwards became director of the press at Rome, established at the expense of Agostino Chigi; and there Caliergus published editions of Pindar and Theocritus, the first Greek books printed at Rome. The first Arabic printing-press in Europe was set up at Fano, under the auspices of Pope Julius II.; the earliest book printed from it bears date in the year 1514.

"Those periods of time," says Mr. Roscoe, in his *History of Lorenzo di Medici*, "which have been most favourable to the progress of letters and science, have generally been distinguished by an equal proficiency in the arts. The productions of Roman sculpture in its best ages bear nearly the same proportion to those of the Greeks, as the imitative labours of the Roman authors bear to the original works of their great prototypes. During the long ages of ignorance that succeeded the fall of the Western Empire, letters and the fine arts underwent an equal degradation; and it would be as difficult to point out a literary work of those times which is entitled to approbation, as it would be to produce a statue or a picture. When these studies began to revive, a Guido da Sienna, a Cimabue, rivalled a Giotto d'Arezzo, or a Piero della Vigne. The crude buds that had escaped the severity of so long a winter soon began to swell, and Giotto, Buffalmacco, and Gaddi, were the contemporaries of Dante, Boccaccio, and Petrarca."

In connection with the progress of literature in the sixteenth century, we may mention the famous Vatican Library. We learn from Aulus Gellius that, in the age of Imperial Rome, the word "Vatican" was applied to the hill and to the deity who presided over it, from the "*vaticinia*," or prophecies there uttered by the power or inspiration of the god; but Marcus Varro, continues Gellius, in his book on "*Divine Things*," gives another reason for this name. "As Aius," says he, "was called a deity, and an altar was built to his honour in the lowest part of the new road, because in that place a voice from heaven was heard, so this deity was called Vaticanus, because he presided over the principles of the human voice; for infants, as soon as they are born, make the sound which forms the first syllable in Vaticanus, and are therefore said *vagire*, to cry, which word expresses the noise which an infant first makes." Cicero and Livy both state that this voice warned the Romans that the Gauls were about to assault the city, for which reason an altar or temple was raised to Aius.

A library had always been attached to the Papacy from the earliest periods. The primitive contents were the Old and New Testaments, the Acts of the Martyrs, and the Decrees of Councils. Seven notaries were appointed to take care of the collection. Pope St. Hilary erected near the Lateran two libraries, in which the most important works were preserved. Calixtus III. augmented them with the books of the library, called Augusta, which were obtained from Constantinople. When the papal chair was removed to Avignon, the books were taken also, and remained there

till the pontificate of Martin V., when the greater part were brought back; and Nicholas V., elected in 1447, placed them in the Vatican, where the Pope had now fixed his residence. That pontiff largely increased the collection, for he directed his legates and nuncios, wherever the influence of the Roman See was dominant, to add to the literary treasures of Rome. His immediate successors were not men of learning, and literature was neglected; but Sixtus IV., elected in 1480, pursued with zeal the ideas of Nicholas, and purchased books in all quarters; he built the Vatican Library for their reception, and placed in it the manuscripts which, before his reign, had been kept in the Lateran Palace; he also nominated a curator, and gave free access to the public. Julius II. and Leo X. annually appropriated large sums to augmenting the collection. Urban VIII. added to it the library of the Elector Palatine; Alexander VII., that of the Duke of Urbino; Alexander VIII., that of the Queen of Sweden; and Clement XI. placed in it many Arabic, Armenian, and Syriac manuscripts, as well as Bibles in those languages. In this splendid edifice are portraits of those who have been librarians, and of the ten Sybils, attributed to Marco da Faenza. On the walls are painted several of the general councils of the Church, and representations of the most celebrated libraries that have existed in various parts of the world: such as that instituted by Moses, and restored by Esdras, in which were kept the Books of the Law, of the Prophets, of the Judges, and the Acts of the Kings; that of Pisistratus, the tyrant of Athens, transferred by Xerxes to Persia, and restored by Seleucus to the same city; that of Ptolemy Philadelphus, King of Egypt, enlarged by Demetrius Phalareus; that of Augustus, in which were preserved the Sybilline Books; and the much renowned library of Trajan. On the pilasters are represented the first inventors of languages, among whom are Adam, the first master of the sciences and of the Hebrew letters; Abraham, the inventor of the Syriac and Chaldean; Esdras restoring and increasing the Hebrew alphabet; Isis and Memnon rediscovering the Egyptian characters; Palamedes and Simonides increasing the number of the letters; Hercules, author of the Phrygian letters; Phineas, author of the Phœnician; Carmenta, mother of Evander, inventress of the Latin; St. John Chrysostom, who invented the Armenian characters; and St. Jerome, who invented the Illyrian. In the spaces between the arches and the windows are many scenes from the papal reign of Sixtus V., who enlarged the library after the designs of the architect Fontana: as—the coronation of that Pope; his taking possession of the pontificate; erecting the four large obelisks; rebuilding the Lateran Palace; raising the statue of St. Peter on the Trajan Column, and that of St. Paul on the Antonine Column. The books and manuscripts are remarkable for their number and rarity. In the collection is a Bible in Greek, written in the sixth century; one in Hebrew, of an extraordinary size, which once belonged to the Duke of Urbino, for which the Jews in Venice would have given its weight in gold; a Greek manuscript of the Acts of the Apostles, admirably written in gold letters, a present from Carlotta, Queen of Cyprus, to Innocent VIII.; a Virgil, written in square letters before the fifth century, with miniatures of the dresses of the Trojans and Latins; a Terence of the same antiquity, written in similar characters; and another Terence of the ninth century, with figures and masks, such as were used in olden times. The Vatican Library, the Vatican Palace, and the Vatican Basilica, or St. Peter's, with the Museum Pio-Clementinum, are intimately associated with the rise and progress of the arts and literature, and in a pictorial and sculptural sense belong to the Italian Court;—as these buildings attest the fame of painters, architects, and statuary, and contain their noblest productions, with the choicest specimens of gems, cameos, medals, intaglios, and other ingenious engravings on precious stones. Of these works of skill, the Crystal Palace, from want of space, only contains a few specimens, which afford but a glimpse of the history of the epoch in which the arts were carried to the highest perfection; and a book of this character would fail in its object were it confined to a mere description of the actual contents of the Italian Court.

The popes not only encouraged literature, but vied with each other in widening the streets of Rome, searching for antiquities, and embellishing the city by architectural improvements. The Rome of the middle ages, during the absence of the Popes at Avignon, had sunk into decay; and when Pope Eugenius IV. returned to it in the year 1443, it had become a city of herdsmen. The hills had been abandoned, and the plains bordering on the Tiber alone contained

the dwellings of man. There was no pavement in the streets, through which cattle wandered about as though they were meadows. The lower grounds had become undrained marshes, where wild ducks congregated. The Capitol was known as the Goat's Hill, and the Forum Romanum had received the appellation of the Cow's Field. Pope Nicholas V. was the first great restorer of the city. Julius II., a soldier rather than a priest, and who ascended the Papal throne in the year 1503, proved himself a most energetic and enlightened reformer. "He," says Ranke, "did not rest satisfied with the projects of St. Peter's Church, which rose majestically under his direction; he also restored the Palace of the Vatican, and erected the Loggia, a work of consummate beauty of conception. His cousins, the Riari, and his treasurer, Agostino Chigi, rivalled each other in the beauty of the houses they constructed; that of Chigi, the Farnesina, admirable for the perfection of its plan, and decorated by the matchless hand of Raffaello, is unquestionably the superior. On the northern side of the river, posterity is indebted to Julius II. for the completion of the Cancellaria with its cortile, executed in those pure and harmonious proportions which render it the most beautiful court in existence. His cardinals and barons imitated his example." In architecture this is the epoch of Bramante, Michael Angelo, and their illustrious contemporaries; and also of the great painters and sculptors who embellished the interiors of their magnificent structures, monuments of whose genius are collected in the Italian Court, which will hereafter be specially described.

Leo X. commissioned Raffaello to frame a report on the antiquities of Rome, which is so full of historical and artistic interest, and so characteristic of the spirit of the age, that we shall cull some extracts from this curious production. After lauding the grandeur and magnificence of ancient Rome, and lamenting the devastation committed by the barbarians, the great painter exclaims—"But why should we complain of the Goths, the Vandals, or other perfidious enemies, whilst they who ought, like fathers and guardians, to have protected the defenceless remains of Rome, have themselves contributed towards their destruction? How many have there been, who, having enjoyed the same office as your Holiness, but not the same knowledge, nor the same greatness of mind, nor that clemency in which you resemble the Deity,—how many have there been, who have employed themselves in the demolition of ancient temples, statues, arches, and other glorious works? How many who have allowed these edifices to be undermined, for the sole purpose of obtaining the *pozzolana* from their foundations; in consequence of which they have fallen into ruins! What materials for building have been formed from statues and other antique sculptures? Inasmuch, that I might venture to assert that the new Rome which we now see, as large as it may appear, so beautiful and so ornamented with palaces, churches, and other buildings, is wholly composed of the remains of ancient marble. Nor can I reflect without sorrow, that ever since I have been in Rome, which is not yet eleven years, so many beautiful monuments have been destroyed; as the obelisk that stood in the Alexandrian road, the unfortunate arch, and so many columns and temples, chiefly demolished by M. Bartolommeo della Rovere. It ought not, therefore, Holy Father, to be the last object of your attention, to take care that the little which now remains of this the ancient mother of Italian glory and magnificence, be not, by means of the ignorant and the malicious, wholly extirpated and destroyed, but may be preserved as a testimony of the worth and excellence of those divine minds, by whose example we of the present day are incited to great and laudable undertakings." On the death of his uncle, Bramante, Raffaello was appointed papal architect. Leo acted on his advice, and a penalty was imposed on all persons who, having discovered an ancient edifice, did not report it within three days to Raffaello. This measure saved many beautiful objects from destruction. Heavy fines were attached to the defacement of inscriptions. It had been, and in spite of the new laws, it continued to be the practice to burn marble statues to obtain lime for the new buildings; and to such an extent was this practice carried, after Leo's death, that, in the year 1534, Paul III. issued a bull which made such acts capital offences, but the bull was not respected. At a later period the Farnese, the Mattei, the Borghese, and the Barberini families, searched for and collected statues and inscribed marbles, to adorn their museums. Several of the Popes themselves used the materials of the old buildings in constructing new edifices. Paul II. used the stones of the Coliseum to build a palace. Paul III.

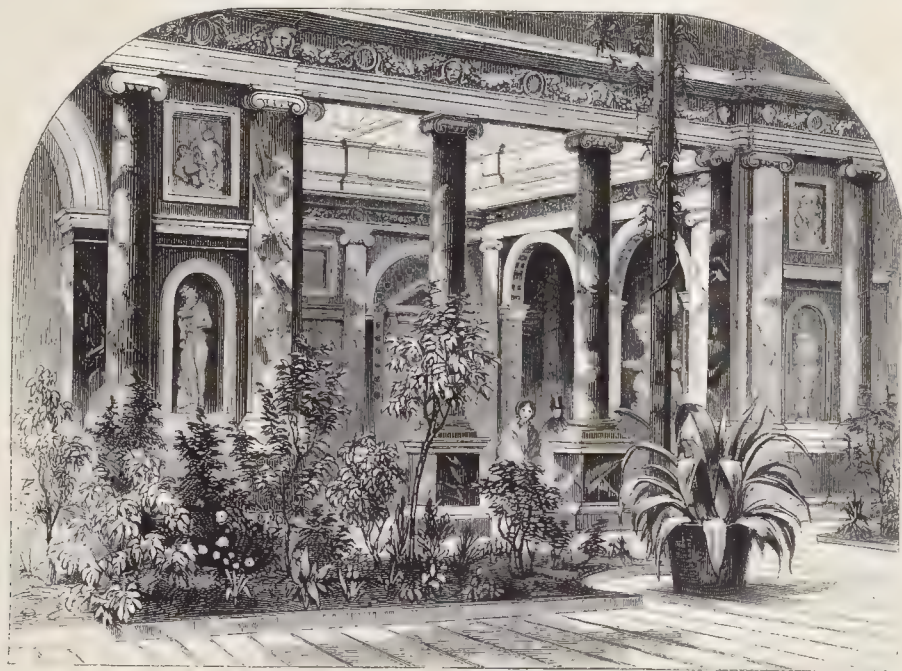
and his nephews also plundered the Flavian Amphitheatre. Sixtus V. carried away the remains of the Septizonium of Severus for the service of St. Peter's. Urban VIII. removed the bronze beams from the portico of the Pantheon, which weighed more than fifty-five millions of pounds, and also attacked the base of the tomb of Cecilia Metella. He was one of the Barberini family, and gave a share of the spoil to his nephew to embellish the Barberini Palace, and this gave rise to the pasquinade,—

"Quod non fecerunt barbari Romæ, fecerunt Barberini."

Leo X. died in 1521, and notwithstanding the acts of plunder to which we have referred, from that date, with more or less energy, the impulse imparted to the improvement of the city by Julius II. was continued to the pontificate of Sixtus V., who assumed the tiara in 1585, and it was that pontiff who placed the cupola on St. Peter's. Under him Rome was nearly doubled in size, but this admirer of art paid no respect to the works of pagan antiquity. He completely demolished the Septizonium of Severus, which had

sculptors, and architects of the period, and mark the difference between them and their predecessors who flourished in the earlier epoch of the Renaissance. The style of painting in most parts of Italy at the commencement of the sixteenth century is thus characterised by Theodore Ducas, an observant and intelligent traveller, and the contemporary of many of the illustrious men of that age. "I only repeat," says he, "the judgment of the most skilful *virtuosi*, in saying that the masters of the old school of painting had attained to great excellence. Men imitated from nature rather than from each other. There was a speaking vivacity of countenance that admitted of very little improvement; but ideal beauty of form, roundness and freedom of design, variety in composition, and propriety both in colour and aerial perspective, yet were wanting."

Vasari, in the introduction to the third part of his *Biographies*, considers that in the five distinctive properties or characteristics of rule, order, proportion, design, and manner, the masters of painting, sculpture, and architecture, who flourished in the second epoch of the Renaissance, far exceeded their predecessors, but fell short of



FAÇADE OF THE ITALIAN COURT.

survived the ravages of so many centuries; and, had he lived, the tomb of Cecilia Metella would have shared the same fate. With the one hand he destroyed, with the other he built. His desire was to leave Rome at his death purely Christian, by removing every vestige of heathenism. Ranke affirms that he could not endure the sight of the Laocoon and the Apollo Belvedere, and that he threatened to pull down the Capitol unless the statues of ancient Rome were removed. Jupiter Tonans and Apollo were in fact removed, and Minerva only remained by surrendering a spear held in her hand, for which an enormous cross was substituted. Sixtus V. raised the statue of St. Peter on the summit of the column of Trajan, and that of St. Paul on the summit of the column of Antoninus.

In the sixteenth century, not only Rome, but all the principal cities of Italy, sought to rival each other in the artistic movement, which also crossed the mountains, and penetrated other countries of Europe. In the Italian Court beautiful specimens of this improvement are collected with taste and judgment; but to appreciate them rightly we must make ourselves acquainted with the painters,

that perfection to which their successors attained. In his judgment they were defective in the following points:—they wanted freedom in the *Rule*, variety of invention in the *Order*, rectitude of judgment in the *Proportion*, judicious treatment in the *Design*, and grace in *Manner*. In depicting the muscles, he says, "they were deficient in that graceful facility which holds the medium between suffering them to be seen and not displaying them, which is apparent in the life." They failed in giving lightness and softness to form, particularly to the forms of women and children. Variety and beauty were wanting in the vestments. They did not achieve "a certain delicacy of finish, and that ultimate charm of perfection in the feet, hands, hair, and beard, which alone can satisfy the cultivated judgment and the refined taste of the master in art. Had these masters attained to that minuteness of finish which constitutes the perfection and bloom of art, they would also have displayed power and boldness in their works, when the result would have been a lightness, beauty, and grace, which are not to be found." Vasari, of course, admits that they laboured under many disadvantages, not having those models to which their successors had access

enumerating the Laocoon, the Hercules, the Belvedere, and others, "in which softness and power are alike visible; which display roundness and fulness justly restrained; and which, reproducing the most perfect beauty of nature, with attitudes and movements wholly free from distortion, but turning or bending gracefully in certain parts, exhibit everywhere the flexibility and ease of nature, with the most attractive grace."

First in the order of date of this new school, scarcely inferior to any in painting and sculpture, and immeasurably superior to all in the wonderful variety of his attainments, stands Leonardo da Vinci, born in 1452, and who died in 1519. Possessing an intellect clear, subtle, comprehensive, and profound, he would have excelled in any pursuit to which he might have directed his colossal genius. He was a poet and a musician; and, in a land of song, yielded to few, if to any, as an improvisatore. His mathematical knowledge was of a very high order, and in the art of civil and military engineering he had no equal among his contemporaries. He was the first who suggested the formation of a canal from Pisa to Florence, which was executed two centuries afterwards by Vincenzio Viviani, a disciple of Galileo. Vasari enumerates many of his inventions: he made designs for mills and fulling machines—showed how mountains might be removed or tunnelled—applied levers, cranes, and screws, to the raising of weights—and pointed out the means by which harbours might be deepened, cleansed, and kept in a constant state of efficiency. Leonardo was master of the most intricate problems of astronomy then known; and, having dissected several bodies with his own hand, he published a volume of anatomical drawings. "In this book," says his biographer, "he set forth the entire structure, arrangement, and disposition of the bones, to which he afterwards added all the names in their due order, and next supplied the muscles, of which the first are affixed to the bones; the second give the power of cohesion, or holding firmly; and the third impart that of motion. Of each separate part he wrote an explanation." For the amusement of Leo X. he made certain hollow figures of animals with wax, which he filled with air, and when he blew into them they flew about. By putting quicksilver into the skins of lizards, flayed for the purpose, and fixing wings upon them, he caused these reptiles to walk, and the wings to flap. He wrote a work on the anatomy of the horse; and, in a letter written by him to the Duke of Milan, in 1483, when he was little more than thirty years of age, he displayed his knowledge of military engineering. He offered to construct portable bridges, fireproof, and to burn those of the enemy; to manufacture bombs; to drain ditches, and supply fascines and scaling-ladders; to destroy fortresses where they could not be bombarded; to break the ranks of an army by propelling against them covered and indestructible waggons; to make cannon on a new principle, applicable both on land and at sea; and also powders and vapours for the destruction of the enemy. These details will be interesting to those who understand that great epochs are the creations of great men, on which they stamp the impress of their genius. The Crystal Palace is a register of such epochs, illustrating them by monuments of science and art, and then tracing the progress of intelligence from era to era in different countries. In this resides the utility of the instruction it affords; and it would be a trivial and almost barren task to describe the treasures of a temple as a mere catalogue, and omit all mention of those by whom the treasures were called into existence. The Crystal Palace itself forms an epoch in architecture; and posterity will read with interest whatever relates to its projector and his coadjutors. We, too, in our time, when studying the past, derive gratification from obtaining an insight into the career of those illustrious men who brought the third epoch of the Renaissance to perfection.

In more special reference to the artistic object of this work, Leonardo da Vinci is to be considered as a painter. When a pupil of Andrea Verrochio, he introduced the figure of an angel into a picture, representing St. John baptising Christ, which his master was executing; and it was so excellent that Verrochio never more touched colours, confessing himself surpassed by a youth. All Leonardo's works were masterpieces, though a general preference has been given to his "Last Supper," in which all the figures are marked by distinct characteristics; the several apostles displaying, each according to his peculiar feelings, the emotions of anxiety, affection, anger, grief, terror, and surprise, as they are unable to comprehend or interpret the predicted betrayal of their divine master. This magnificent production, painted for the Dominican

monks of Santa Maria della Grazie, at Milan, on the walls of their refectory, is now in a very ruined condition,—an irreparable loss to art. Francis I. wished to remove it to Paris, but failed in the attempt. Having filled Italy with his fame, and ruled supreme in art, he at length found a rival in the growing talents of Michael Angelo, and retired to France, where he died in the sixty-seventh year of his age, having enjoyed the personal friendship of the French monarch, who held him in the highest honour and esteem.

Two of the greatest and most familiar names connected with the arts of design in the sixteenth century are those of Raffaello and Michael Angelo. Several specimens of their skill are exhibited in the Italian Court, but, before we notice them, we shall briefly sketch the biographies of these illustrious rivals.

Raffaello Sanzio, a native of Urbino, was born in 1483. Among his earliest works he executed the cartoons for the library of the ducal palace at Siena, which he completed in 1504, at which period he went to Florence; and from that date, up to the year 1508, he was engaged in the practice of his art, sometimes at Florence, sometimes at Urbino. He was the nephew of the famous architect Bramante,* by whose influence he obtained a commission to paint the chambers of the Vatican Palace, which compelled him to take up his residence at Rome. His productions in that capital were in a hall of the Vatican called the Camera della Signatura. On the roof he represented Theology, Philosophy, Poetry, and Jurisprudence, each by an appropriate emblem. The first fresco depicted the controversy on the true interpretation of the sacrament; in the second, Tribonian presents the Code to the Emperor Justinian, and Pope Gregory IX. delivers the Decretals to a member of the Consistory; Parnassus, with Apollo seated in the midst of the Muses, occupies the third; while the fourth is devoted to the famous school of philosophy at Athens. Roscoe observes that it is an error to designate the first of these frescoes as "the Dispute on the Sacraments;" but he does not point out where the error consists, and we have retained the popular reading. "The scene comprehends both earth and heaven; the veil of the empyreum is withdrawn; the eternal Father is visible; his radiance illumines the heavens; the cherubim and seraphim surround him at an awful distance; with the one hand he sustains the earth, with the other he blesses it."† Such a representation accorded with the spirit of the age, and it was imitated by many other painters; and the same audacity or want of judgment had been displayed in the earlier periods of the Renaissance. In our days any pictorial representation of the Deity would be unequivocally condemned.

In 1511, at the request of Agostino Chigi, the famous Siennese merchant, who had been treasurer to Julius II., Raffaello painted the prophet Isaiah, in the Church of St. Agostino, and adorned the Chigi Chapel, in the Church of La Madonna della Pace, with frescoes of the four sybils. For the tapestry-weavers of Flanders he executed twelve cartoons of the Acts of the Apostles. By the order of Leo X., he embellished the Vatican with the liberation of St. Peter from prison, the departure of Attila from Rome, and the burning of part of Rome in the time of St. Leo, who arrests the spreading of the flames by the sign of the Cross. This last scene is considered one of the most remarkable of his frescoes. The finest group is that of a young man bearing his father on his shoulders. Theodore Ducas says that Raffaello "painted these two figures in order to convince those who admired Michael Angelo exclusively, that he, as well as that master, possessed a complete knowledge of anatomy." Leo X. wished him to paint the history of Constantine, but he only lived to execute the two figures of Justice and Mercy. His oil-painting of "Christ on Mount Thabor," otherwise called the "Transfiguration," was his last performance, and is pronounced the perfection of art. The merits of this extraordinary man are universally recognised. Ducas says of him, "In propriety of design, elegance of fancy, and enchanting grace, Raffaello is the first painter in the world. In colouring he has not the freshness nor the vivacity of Titian, nor the breadth of light and shade of Correggio. In the sublime, in philosophical abstraction of character, he was surpassed by Michael Angelo; but as the painter of the passions he acknowledges no superior." M. Guizot, in his *Essay on the Fine Arts*, pronounces the following criticism on the great master:—"In the thirty-seven years of his short life, Raffaello traversed a distance equal to that which usually lies between separate epochs of art.

* This relationship has been denied by some recent writers.

† Roscoe's Life of Leo X., vol. ii. p. 326. Bohn's Edition.

He gained his earliest triumphs when he equalled Perugino; his latest is, that he has hitherto remained unequalled, even by the greatest of his successors. Others had, before him, laid the foundation of the glory of painting; but its full blaze was concentrated on him. Whether he was assisted by the intercourse and advice of Leonardo da Vinci, or whether—as is affirmed by Vasari, though denied by most other critics—he profited by the study of the works of Michael Angelo, in either case, he gained the advantage which a man of genius will always gain from truth, according to the saying of Molière—*‘Je prends mon bien partout où je le trouve.’* Vasari says of Raffaello, that he was *‘molto eccellente in imitare,’* with a rare power of imitation; but, indeed, there was nothing about him which was not entirely his own, excepting, perhaps, the faults of his early manner, which were planted in him unconsciously by his education, not derived from himself. His was a mind endowed with the rare good fortune, the portion only of the few, of being, in regard to his art, in perfect harmony with the age in which he lived; rich in the power of acquisition, at a time when the germs of all things were bursting into life with an incredible vigour; pre-eminent in the faculty of discrimination, at a time when there was no need but to choose; at once the swiftest in the race in which the spirits of men were then hurrying on, and the most steadfast and unswerving in that illustrious career in which success was certain, if only errors were avoided.”

Sir Joshua Reynolds has drawn the following parallel between Raffaello and Michael Angelo. “If,” he observes, “we put these great artists in a light of comparison with each other, Raffaello has more taste and fancy, Michael Angelo more genius and imagination. The one excelled in beauty, the other in energy. Michael Angelo has more of the practical in operation; his ideas are vast and sublime; his people are a superior order of beings; there is nothing about them, nothing in the air of their actions or their attitudes, or the style and cast of their limbs or features, that puts us in mind of their belonging to our species. Raffaello’s imagination is not so elevated; his figures are not so much disjoined from our diminutive race of beings, though his ideas are chaste, noble, and of great conformity to their subjects. Michael Angelo’s works have a strong, peculiar, and marked character; they seem to proceed from his own mind entirely; and that mind so rich and abundant, that he never needed, and seemed to disdain, to look abroad for foreign help; Raffaello’s materials are generally borrowed, though the noble structure is his own. The excellency of this extraordinary man lay in the propriety, beauty, and majesty of his characters; his judicious contrivance of composition, correctness of drawing, purity of taste, and the skilful accommodation of other men’s conceptions to his own purposes.”

The arcades of the Italian Court, in the Crystal Palace, are copies of Raffaello’s decorations of the Loggie of the Vatican. The Loggie are the galleries which were intended to unite the detached parts of that immense fabric. They were commenced by Bramante, who left them unfinished. That famous architect was born in 1444, and died in 1514. He was a native of Urbino, and his earliest study was the Duomo of Milan. He enjoyed the patronage of both Pope Alexander VI. and of Julius II. The art of architecture was greatly enriched by his inventions; among other improvements he introduced the method of vaulting with gypsum, and that of preparing stucco, nor did he spare any labour in perfecting the minutest details. The praise of Michael Angelo puts the crown on his fame. In a letter to a friend that illustrious man says, “Bramante was equal to any architect who has appeared from the time of the ancients to our own.” The first stone of St. Peter’s was laid by him, not after an obscure and confused plan, but in accordance with a design which was clear, comprehensive, and luminous. On his death, Leo X. commissioned Raffaello to complete the Loggie, and embellish them with appropriate ornaments in painting, carving, and stucco. “This afforded the artist an opportunity of displaying his knowledge of the antique, and his skill in imitating the ancient grotesque and Arabic monuments, specimens of which then began to be discovered, as well in Italy as in other places, and which were collected from all parts at considerable expense by Raffaello, who also employed artists in various parts of Italy, and even in Greece and Turkey, to furnish him with drawings of whatever remains of antiquity might appear deserving of notice.”* It is not to be supposed that he executed this gigantic work entirely with his own

hand. It was indeed chiefly executed from his drawings by his pupils and assistants, and he gave the finishing touches. These paintings in the Loggie have frequently been engraved, in fifty-two pieces, and are known by the name of the “Bible of Raffaello.” As specimens of the style of mural decoration which became popular throughout Italy, they are deserving of special study, independently of their intrinsic merits.

We take the following description of the Loggie from Kugler:—“The Loggie are open galleries built round three sides of the Court of St. Damascus (the older portion of the Vatican Palace). They were begun by Bramante under Julius II., and completed by Raffaello under Leo X. They consist of three stories; the two lower formed by vaulted arcades, the upper by an elegant colonnade. The first arcade of the middle story was decorated with paintings and stuccoes under Raffaello’s direction; it leads to the Stanze, so that one master-work here succeeds to another. If we consider the harmonious combination of architecture, modelling, and painting, displayed in these Loggie—all the production of one mind—there is no place in Rome which gives so high an idea of the cultivated taste and feeling for beauty which existed in the age of Leo X. The walls round the windows on the inner side of the Loggie are ornamented with festoons of flowers and fruits of great beauty and delicate style. The other paintings which adorn the walls, alternately with small stuccoes, represent animals of various kinds, but consist principally in the so-called Arabesque or grotesque ornaments. The lightest and most agreeable play of fancy guides the eye, by graceful changes, from one subject to another. It is the embodying of a fabulous poetry, which connects the strangest forms of fancy with those of vivid reality. The stuccoes consist of various architectural ornaments, and an almost innumerable multitude of reliefs, of small busts, single figures, and groups which principally represent mythological subjects; they exhibit a spirited imitation of the antique style, and in some cases of actually existing monuments.”†

The ten tapestries by Raffaello, which were intended to adorn the Sistine Chapel, represent scenes in the lives of the Apostles. He furnished the cartoons in distemper colours, seven of which are in Hampton Court. The tapestries are kept in the Vatican. They were worked from the cartoons at Arras, in Flanders, and hence were called “Arazzi.” They formed two series. The first contained the following subjects:—1. The Miraculous Draught of Fishes. 2. The Delivery of the Keys to Peter. 3. The Healing of the Lame Man. 4. The Death of Ananias. 5. The Stoning of Stephen. In the second series are:—1. The Conversion of St. Paul. 2. The Punishment of the Sorcerer Elymas. 3. Paul and Barnabas at Lystra. 4. The Preaching of Paul at Lystra. 5. Paul in the Prison of Philippi. Raffaello executed another series of tapestries, twelve in number, representing subjects taken from the life of Christ, among the finest of which is the Adoration of the Kings.

The vaulted ceiling of the Italian Court nearest the Central Transept is a reproduction of the ceiling in the Camera della Signatura, to which we have already referred. Another work of Raffaello’s, exhibited at the Crystal Palace, is the statue of Jonah being swallowed by the Whale. The execution of this statue, which was to have been accompanied by others, was undertaken at the desire of Agostino Chigi, who intended it for a decoration to his own sepulchral monument, which he desired to have prepared during his life. This, with other figures, was for a long time supposed to have proceeded from the chisel of the sculptor Lorenzetto, it being believed that Raffaello only furnished the models. The tomb was never completed, owing to the death of the great master and his patron. The Jonah alone was finished; the sculpture of which, as well as the model, is claimed for Raffaello by Passavant. It has excited the unbounded admiration both of Italians and foreigners, and any adverse criticism may here be considered as misplaced. However, we will venture to observe that when in the water Jonah could not have placed himself in the erect position in which he is here represented. The placid state of the muscles seems to indicate that he is neither resisting danger nor enduring pain, for the muscles are neither in a state of tension nor contraction. The figure of the prophet is, without doubt, most beautiful; but it appears to us that no spectator can delude himself into the belief that he is witnessing a real action.

We shall now refer to three of the most celebrated pupils of

* Kugler’s Hand-Book of Painting. Edited by Sir Charles Eastlake, p. 39.
† See Engraving, page 84.

* Roscoe’s Leo the Tenth.

Raffaello. These were Giulio Romano, Perino del Vaga, and Gianfrancesco Penni.

Giulio Pippi, surnamed Romano, was born in 1492, and died in 1546. After the designs of his illustrious master, he executed in the papal Loggie the Creation of Adam and Eve, the Building of Noah's Ark, the Discovery of Moses in the Bulrushes, and the Story of Joseph. After Raffaello's death, Giulio finished several subjects which the former had designed for the Hall of Constantine, the principal of which is the Battle between Constantine and Maxentius at the Ponte Molle, near Rome. The moment represented is the crisis of victory. Giulio left Rome after the loss of his preceptor, and repaired to Mantua, and embellished the Palace of the T, so called because the ground-plan of the building resembled that letter.

There he painted the Marriage of Cupid and Psyche in presence of all the Olympian deities. This magnificent work displayed a happy union of the most brilliant fancy and accurate judgment. He depicts the sufferings of Psyche inflicted by the anger of Venus. Mercury is seen arranging the nuptial banquet, while Psyche takes a bath, attended by the Loves; the Graces prepare the toilet-tables, while the Bacchantes sound musical instruments. Silenus is represented on his ass, upheld by satyrs, and Bacchus with two tigers at his feet; on one side of the nuptial tables is a camel, and on the other an elephant. Phœbus appears in the distance on his chariot, while the zephyrs recline on the clouds. In another apartment is the story of Dædalus and Icarus, with a series of subjects descriptive of the twelve months of the year, the principal group of which presents Jupiter launching his thunder against the rebellious Titans. This scene is most vividly portrayed. All the gods and goddesses, seized with terror, take to flight in their cars. Neptune and his dolphins, Minerva and the nine Muses; Bacchus and Silenus, with the satyrs and nymphs; Vulcan with his hammer; Briareus, covered with immense masses of rock; Pluto in his chariot, accompanied by the furies—all are crowded into this vast and wonderful composition; but there is no confusion, the whole being admirably distributed. Vasari pronounces a glowing eulogium on this production. It shows, in his judgment, that Giulio was "gifted with the richest powers of invention, and the most varied resources in art." The vases, goblets, and cups, of the most fantastic and varied forms, depicting the marriage of Psyche, "appear to be of veritable silver and gold."

In the story of Dædalus, the face of Icarus is pale as that of a corpse, and the whole composition is so admirably worked out, that it appears to be reality itself. The effect of the solar heat, as it melts the waxen wings of the unhappy youth, is almost rendered palpable to sight—the kindling fire is seen to give out smoke, one almost hears the crackling of the flames. The idolaters of Raffaello insist that the style and execution of Giulio degenerated after his master's death, when he painted without restraint, and according to his own taste and fancy; but others, more impartial, maintain that while the pupil was inferior to the teacher in grace, he surpassed him in majesty. Giulio's style was grand and flowing, and his attitudes in particular were derived from the loftiest conceptions of dignity. He had a fine imagination, most fertile in resources, and a facility of execution which threw an equal charm over the beautiful and the sublime.

Pierino Buonaccorsi, called Perino del Vaga, was born in 1500, and died in 1547. In the Loggie, the subjects he painted from the designs of Raffaello were the histories of Joshua, of Moses, and David. After the sack of Rome, he went to Genoa, and there decorated the Doria Palace in a style similar to that of Giulio Romano, at Mantua. He also is said by some of the critics to have degenerated after his master's death. A beautiful picture by his

hand, in the Louvre, represents the Muses and the Pierides contending in rival songs on Parnassus; and a portrait of Cardinal Pole, now in the collection of Earl Spencer, at Althorp, is an admired performance.

Giovanni Francesco Penni was a pupil of Raffaello's. He was surnamed "Il Fattore." He worked at the Loggie, and painted the histories of Abraham and Lot, and the history of Isaac. He excelled equally in landscape, architectural structures, and in figures. He was proficient in oil, in fresco, and in tempera. Raffaello derived great advantage from him in his tapestries, and in the ceiling of Chigi's Palace, now called the Farnesina. In conjunction with Giulio Romano, he painted the Assumption of the Virgin, at Monteluci, near Perugia. He finally settled in Naples, where he died.

In the works at the Vatican Loggie, Raffaello and his pupils were greatly assisted by Giovanni da Udine, born in 1487, and who died in 1561 or 1564. In his peculiar department this artist was unrivalled; and he is the acknowledged reviver of the stucco of the ancients—an art which had been lost, so that in one sense he deserved to be called an inventor. At the time he flourished, active researches were made in the ruins of the Palace of Titus,

wherein subterranean chambers had been discovered, decorated all over with minute *grotesche*, figures, stories and ornaments, all in low relief. They were termed *grotesche* because they were found in these grottoes or subterranean vaults. Giovanni studied them with great care, and determined to discover the materials out of which the stucco was formed. After various experiments, in which he failed, he at length mixed white marble, reduced to an impalpable powder, with lime extracted from white travertine, and his success was complete. He communicated the result to Raffaello, who at once appreciated its value, and determined on decorating the Loggie with this new quality of stucco, which task he entrusted to Giovanni da Udine, whose wonderful skill enabled him to surpass all the antiques found in the Coliseum and the Baths of Diocletian. Of his productions Vasari speaks in the following animated terms:—

"Where, in the works of any other master, will you find birds more truly natural, so to speak, or which come nearer to the truth, whether as regards the colouring, softness of the plumage, or other praiseworthy qualities, than do those of the friezes and pilasters of the Loggie now in ques-

tion, where they are to be seen of every kind, and in all instances truthful and life-like? Where indeed can we see them of equal merit? We have them exhibited, too, in variety as rich as that of nature herself, some represented in one manner, some in another, but all of varied kinds; many of these exquisite birds, for example, are perched on ears of corn and sheaves of maize, buckwheat, millet, and grain of all sorts; but not of grain only, they are seen among fruits and berries also, of such kinds as the earth has always produced for the sustenance of birds. As much may be affirmed of the fish, and every other manner of water-animal and marine monster which Giovanni represented in the same place. What, indeed, can I say of the innumerable varieties in fruits and flowers, which are here depicted in every possible manner and without end, displaying too, as they do, every tint of colour and change of form which nature has imparted to them at every season of the year, and in all the regions of the world? What again of the infinite assemblage of musical instruments which are also here represented in the most natural fashion? In a word, it may be truly asserted, without offence to other artists, that for a work of this kind the paintings here in question are the most beautiful, the most extraordinary, and the most admirable that have ever been seen by mortal eye."



JONAH, BY RAFFAELLO.





It falls not within the scope of this publication minutely to describe the Vatican Palace, but as it is intimately connected with the artistic glories of the epoch now under review and contains those exquisite productions of Raffaello and his pupils, to which we have referred, a brief account of its history may not be here misplaced. Some antiquarians are of opinion that it stands on the site of the Aurea Domus of Nero, of which we gave some account when describing the Roman Court, and they tell us that the ground was given by Constantine the Great to the Pope St. Sylvester. Other authorities maintain that the Vatican Palace was founded by Pope Symmachus about the year 1500, and enlarged and repaired by his successors; it is, however, certain that Eugenius III., about the year 1145, rebuilt the edifice from the foundation with considerable magnificence. Nicholas III. added new buildings; and Boniface IX., who adorned the whole with marble, paintings, and statues, decreed that in all future time the palace should be the papal residence. What is called the Casino di Belvedere, was erected on the last point of the Vatican Hill by Nicholas V. It affords a fine prospect of the country towards the north, and hence it is called "Belvedere." Subsequently enlargements were made by Innocent VIII. and Alexander VI. The Vatican Palace, according to the measurement of Mr. Eustace, covers a space of 1200 feet in length, and 1000 in breadth, and its elevation is proportionate. Mr. Salmon, the antiquary, states that it contains "twenty-two court-yards, twenty noble staircases, twelve majestic halls, two large and eight small chapels, and about 11,500 rooms, as may be seen from its model, preserved in the Casino of Pius IV." The principal architects of its enlarged dimensions were Bramante, Raffaello, San Gallo, Ligorio, Fontana, Maderno, Ferrabosco, and Bernini.

Michael Angelo Buonarroti, sculptor, painter, and architect, was born in 1474, and died in 1563. At the early age of fourteen, he was placed as a pupil with Domenico Ghirlandajo, who taught him the rudiments of drawing and painting. The master quickly appreciated the wonderful talents of his disciple, and, astonished at one of his youthful performances, exclaimed aloud, "This boy knows more than I do!" He introduced Michael Angelo to Lorenzo the Magnificent, who accepted him as a student in those famous gardens where the princely merchant had deposited his fine collection of statues and other remains of antiquity. There his first production was the imitation of the head of an old Faun, from the antique. "The nose of the original," says Vasari, "was much injured; the mouth was represented laughing; and this, Michael Angelo, who had never before touched the chisel or marble, did in fact copy in

such a manner that the *Magnifico* was utterly amazed. Lorenzo, furthermore, perceived that the youth had departed to a certain extent from the original, having opened the mouth according to his own fancy, so that the tongue and the teeth were in view; he then remarked in a jesting manner to the boy, 'Thou shouldst have remembered that old folks never retain all their teeth, some of them are always wanting.' Michael Angelo, who loved that Signor as much as he respected him, believed in his simplicity that Lorenzo had spoken in earnest, and no sooner saw his back turned than he broke out a tooth, filling the gum in such sort as to make it seem that the tooth had dropped out, and then waited impatiently for the return of the Signor.

When the latter saw what was done, he was much amazed, and often laughed at the circumstance with his friends, to whom he related it as a marvel, resolving meanwhile to assist Michael Angelo, and put him forward."

He was only fifteen years of age when he executed the Faun. Another of his earliest efforts was a basso-relievo of the "Battle of Hercules with the Centaurs," which was admired as the production of an experienced master, not of a youthful student. His "Sleeping Cupid," in marble, the size of life, rivalled the fine productions of antiquity; and with it a curious anecdote is connected. A friend of Michael Angelo's, named Baldassare del Milanese, said to him, "I am certain that, if you bury this statue for a time, and then send it to Rome so treated, that it may look old, you may get much more for it than could be obtained here." This was done; the freshness of the marble disappeared, and the Sleeping Cupid was sold by Baldassare to the Cardinal San Giorgio as an antique: no fraud, however, was intended; then, as now, idle prejudices prevailed in favour of what is old, and against what is new; and the object of the innocent deception was to combat those prejudices, and test the skill of the modern sculptor against



MOSES, BY MICHAEL ANGELO.

the small criticisms of foppish connoisseurs. However, when the cardinal ascertained that what he had purchased as an antique had been recently produced at Florence, he insisted on repayment; and the statue then passed into the hands of the Duke Valentino, who made a present of it to the Duchess of Mantua. The merit of the statue, which was perfect in all points, was then recognised, and the cardinal became an object of ridicule for his ignorance of true art. Nevertheless, he appreciated the genius of Michael Angelo, brought him from Florence to Rome, and engaged him in his service for nearly a year.

In the Crystal Palace may be seen the famous "Pietà" of this unrivalled sculptor, which represents a dead Christ in the lap of

the Virgin. Criticism has pronounced this group faultless. Vasari, though enthusiastic in his praises of Michael Angelo, whose intimate and devoted friend he was, does not exaggerate when he says that "the body of the dead Christ exhibits the very perfection of research in every muscle, vein, and nerve, nor could any corpse more completely resemble the dead than does this. There is, besides, a most exquisite expression in the countenance, and the limbs are affixed to the trunk in a manner that is truly perfect; the veins and pulses are, moreover, indicated with so much exactitude that one cannot but marvel how the hand of the artist should in a short time have produced such a work, or how a stone, which just before was without form or shape, should all at once display such perfection as nature can but rarely produce in the flesh." The draperies are admirable, and the group is most strongly marked by delicacy, elegance, and force. This is the only one of his works on which Michael Angelo carved his name. It appears on the cincture which girdles the robe of the Virgin. He took this step in consequence of strangers from Lombardy declaring that it was the work of Christoforo Solari of Milan, called "The Hunchback of Milan."

Adjoining the Great Transept stands the celebrated statue of "Moses," which alone would immortalise the fame of Buonarroti. It was originally intended for one of the chief ornaments of the tomb of Pope Julius II., which Michael Angelo was commissioned to execute during the life of that pontiff, but the tomb was never finished. The figure is seated in an attitude of solemn and imposing dignity. The great legislator of the Hebrews rests his right arm on the Tables of the Law, the fingers of the hand being fully displayed; the whole of his left arm is bare, and the hand holds back the full and flowing beard. With wondrous skill each separate hair is distinct, as though, to use the expression of Vasari, "the chisel had become a pencil." The face is expressive of the most sublime beauty, yet awful in its grandeur. The anatomical development of the muscles and nerves is perfect. The whole effect is heightened by Moses being arrayed in the most appropriate vestments, and the draperies are exquisite in their foldings. In the noise and crowd of the Crystal Palace, the spectator can hardly do justice to this magnificent work of art; it should be seen amid the silence of a cathedral, with all those accessories of holy influence which a cathedral presents to the mind of contemplative man.

"And who is he, that shaped in sculptured stone,
Site giant-like? stern monument of art
Unparallel'd, whilst language seems to start
From his prompt lips, and we his precepts own.
'Tis Moses; by his beard's thick honours known,
And the twin beams that from his temples dart.
'Tis Moses, seated on the mount apart,
Whilst yet the Godhead o'er his features shone.
Such once he looked, when ocean's sounding wave
Suspended hung, and such amidst the storm,
When o'er his foes the reluctant waters roar'd.
An idol calf his followers did engrave,
But had they raised this awe-commanding form,
Then had they with less guilt their work adored." *

In reference to this statue, Vasari declares that "the Jews are to be seen every Saturday, on their Sabbath, hurrying like a flock of swallows, men and women, to visit and worship the figure, not as a work of the human hand, but as something divine." Cancellieri and Bottari deny the truth of this statement, because Jews do not enter the Roman churches.† But the case is stated as exceptional, and as an act of homage to the genius of Michael Angelo. It is perfectly natural that the Hebrews should have desired to see the statue of their lawgiver, and the church may have allowed them access to contemplate a work of art which was the pride of Rome. What ought to be decisive, is the attestation of Vasari himself. He lived at the time, was the disciple and friend of Michael Angelo, and his scrupulous fidelity as an historian has never been impeached.

The "David," with a sling in his hand, is one of the most remarkable productions of this gifted sculptor, and it is the more worthy of notice on account of the peculiar fate of the block of marble from which it was wrought. Simone da Fiesole had attempted to carve a colossal figure out of it, and failed, and it was put aside in the House of Works, at Florence. Piero Soderini, Gonfaloniere of that city, offered it to Leonardo da Vinci, that this opprobrium of art might be converted into an ornament of the city; but that most eminent man declined the difficult task, as Simone had mutilated the

material. He alleged, indeed, that no work worthy of art could be completed out of it unless the defects were supplied with additional pieces of marble. A similar offer had been made to Andrea Contucci, the famous sculptor, who had acquired a great reputation in Spain and Italy, better known by the name of Andrea Sansovino, so called from his birthplace, Monte Sansovino, near Arezzo, where Pope Julius III. was born. He also declined the offer of Soderini. It was then proposed to Michael Angelo, who remeasured the block, and undertook the work, perhaps prompted by a noble spirit of emulation, and the glory of conquering difficulties which had appalled Da Vinci and Contucci. He allowed some traces of Simone's clumsy chisel to remain, but succeeded to perfection, and his enthusiastic biographer declares that "it was all but a miracle that Michael Angelo performed when he thus resuscitated one that was dead." He affirms that it surpassed all the statues of Greece and Rome. "Neither the Marforio of Rome," he says, "the Tiber and the Nile, in the Belvedere, nor the Giants of Monte Cavallo, can be compared to it. Never since has there been produced so fine an attitude, so perfect a grace, such beauty of head, feet, and hands; nor is so much harmony and admirable art to be found in any other work."

The bronze statue of Julius II. is another of the masterpieces of this prince of sculptors. It was erected in front of the Church of St. Petronio, at Bologna, which city that warlike pontiff had just subjected by force of arms. It skillfully expresses the haughty pride and fierce character of the original. The countenance indicates firmness of mind, and the attitude is grand and majestic. All the details are exquisitely finished, and the drapery has been highly praised for the boldness and ease of the folds. The right arm is extended, displaying considerable energy. This the pontiff observed, and asked Michael Angelo whether he intended to represent him as dispensing his curse or his blessing. The prudent artist replied that his idea was to represent his holiness in the act of admonishing the citizens of Bologna to behave themselves discreetly; and he then asked whether he should not put a book in his hand. "No," replied Julius, "I know little of letters, and have small book learning; I am a soldier at heart, put a sword in my hand."

Between the columns of the side of the Italian Court, parallel to, but furthest from the Nave, is a colossal upright figure of "Christ bearing his Cross," by Michael Angelo. It would seem, however, from the statement of Vasari, that he only furnished the design, for the biographer says, "about this time Michael Angelo sent his disciple, Pietro Urbano of Pistoja, to Rome, there to execute a figure of Christ with the Cross, which is indeed a most admirable performance; it was afterwards erected beside the principal chapel in the Minerva, by M. Antonio Melli." The Minerva means the Church of Santa Maria Sopra Minerva, and takes its name from being built on the ruins of the Temple of Minerva, erected by Pompey the Great, in gratitude for the numerous victories he had gained in the ten preceding years. Pope Zacharias gave it and a small convent to some nuns who came from Greece, who were afterwards transferred to another building in the Campus Martius. About the year 1370, the chapel was given to the Dominican friars, who, with the assistance of several benefactors, built on the old site the noble Gothic church which now remains. It contains many splendid works of art, among which are the monuments of Leo X. and Clement VII., in the choir, by Bandinelli; the statue of Leo, by Raphael di Monte Lupo, and that of Clement, by Baccio Bigio. The celebrated statue of "Christ," by Michael Angelo, was originally placed on one side of the pilaster of the high altar, while at the other stood the statue of the "Virgin," by Siciliano.

Near the "Pietà," in the Italian Court, is the "Slave," by Michael Angelo, originally designed by the sculptor to form one of the ornaments of the tomb of Julius II. It is now in the Louvre. This statue is finely executed. One arm is thrown over the head; the hand of the other rests on the chest, just under the band drawn across the upper part of the body—the symbol of lost freedom. The anatomy is strongly marked. The expression of the countenance is sad and dispirited.

The Italian Court contains copies of the two famous tombs erected in honour of the Medici family—that of Giuliano, Duke of Nemours, brother of Leo X., and that of Lorenzo, Duke of Urbino. The figures of both princes are admirable. Lorenzo is thoughtful and reflective, and the Italians call the statue "Il Pensiero." Giuliano is represented as haughty of aspect. Both are clothed in

* Translated from the Italian of Giovambattista Zappi, by William Roscoe.
† Bohm's Edition of Vasari, vol. v. p. 249.







armour, and are placed above the sarcophagus. Beneath, on the pediments, are four reclining statues, two to each. Under the tomb of Lorenzo are "Dawn" and "Twilight," and under that of Giuliano, "Day" and "Night." These, of course, are allegorical of life and death. Messrs. Wyatt and Waring, in commenting on these tombs, observe, "We think that in order justly to appreciate this monument and its companion, they should be regarded only as expressions of sentiment or embodiments of some thought; and as such, they rank certainly among the most remarkable productions of the kind which the great author of them has produced." These critics consider the unfinished head of the "Twilight" as "grandly mysterious;" but they do not think that the "Dawn" or "Aurora" is obviously related to the subject, though a "figure of great power." The "Aurora" is a nude figure, whose attitude shows that she has hastily risen from her bed, her eyes still heavy with slumber; and, as Vasari remarks, thus awakening, she finds the prince dead. In this view, Aurora eloquently accounts for her presence at the tomb. The statue of "Night" is most appropriate, symbolizing the physical death of nature, as



PIETA, BY MICHAEL ANGELO.

work of Da Vinci, the "Battle of the Standard"—has been the theme of universal admiration. The Florentine soldiers, while bathing in the Arno, hear the enemy attacking the camp. All hurry to the shore, to array themselves for combat. This conception of the

subject gave full scope to the wonderful genius of the artist, and the whole scene is full of varied and animated life. Those who have reached the bank are putting on their armour, others are swimming lustily to join their comrades; some are clambering up the sides of the river. Some are mounting their horses. Other groups have their clothes in their hands; they stand, they kneel, they stoop forward, they grasp their weapons; all is action, excitement, fire. All the critics who have commented on this cartoon have followed Vasari in bestowing special praise on the figure of an old man, "who, to shelter himself from the heat, has wreathed a garland of ivy round his head, and, seated on the earth, is labouring to draw on his stockings, but is impeded by the humidity of his limbs. Hearing the sound of the drums and the cries of the soldiers, he is struggling violently to put one of the stockings on, the actions of the muscles and the distortion evince the zeal of his efforts, and prove him to be toiling all over, even to the points of his feet." This cartoon stamped the reputation of Michael Angelo as a painter; and when Julius II. resolved on decorating the chapel erected by his uncle, Sixtus IV., with a series of paintings on sacred subjects, he confided the work to that great artist. Within the short space of twenty months he adorned the ceilings of the Sistine Chapel with fresco-paintings of marvellous beauty; and the best critics, estimating the extent of the undertaking, and the excellence of the performance, consider that its completion would have occupied the whole life of an ordinary artist. It must not, however, be understood that his sole hand was engaged in the Capella Sistina, as he invited several painters to assist him in the mechanical part of his art, but they worked entirely under his directions. At length he dismissed them all, finding them inadequate, and finished the work alone, even grinding and preparing his own colours.



CHRIST, BY MICHAEL ANGELO.

light disappears in the presence of darkness. At the period when these tombs were executed, many verses in Latin and Italian were written in their praise. Vasari has preserved the following, by Battista Strozzi, and the reply of Michael Angelo:—

"The Night that here thou seest,
in graceful quiet
Thus sleeping, by an angel's hand
was carved
In this pure stone; but sleeping,
still she lives.
Awake her if thou doubtst, and
she'll speak."

The great sculptor, speaking in the name of Night, thus answered:—

"Happy am I to sleep, and still
more blest
To be of stone, while grief and
shame endure;
To see, nor feel, is now my utmost
hope.
Wherefore speak softly, and awake
me not."

We have now to consider Michael Angelo as a painter. It has already been stated that the great Leonardo da Vinci recognised in him, while yet a very young man, a formidable rival. In fact, Michael Angelo's cartoon of the "War of Pisa"—preferred to the



SLAVE, BY MICHAEL ANGELO.

The ceiling of the Sistine Chapel is divided into compartments, all of which are filled up with subjects taken from sacred history; and on the walls are the sublime figures of the prophets and the terrific representations of the sibyls. In the centre of the ceiling is the history of the world, from the Creation to the Deluge. With a daring hand, Michael Angelo has attempted to depict what even his transcendent genius ought not to have attempted: he has introduced the Supreme Being separating light from darkness, creating the sun and moon, and dividing earth from water. The creation of Adam and Eve, the temptation by the serpent and the fall, the sacrifice of Cain and Abel, and the inebriation of Noah, are among the most conspicuous narratives represented by the great master. This work he executed during the pontificate of Julius II.; and, under that of Clement VII., he painted his masterpiece, "The Last Judgment," also in the Sistine Chapel, behind the altar. As a work of art, this magnificent production, both in its conception and treatment, is unrivalled; and, on account of its unapproachable excellence, it has been termed "the admiration and reproach of future artists." It was completed under the pontificate of Paul III. Alessandro Guido wrote a sonnet on it, thus translated by Mr. Roscoe:—

"I see the awful judgment-day unfold,
Tuscan Apelles, pictured by thy hand.
When such strong tints of ire and rage expand,
That my heart shudders and my blood runs cold.
Down towards th' infernal gulf in tumult
roll'd,
I see the sinful crew; and fear-struck stand;
Check'd in those vain pursuits I once had
plann'd,
Whilst timely dread restrain'd transgression
bold.
I see the happier train, who far apart
From danger move, and joyful take their
place,
Amidst the cloudless regions of the blest.
O wondrous effort of the painter's art!
Where colours are God's ministers of grace,
'That with new ardours fire my glowing breast."

In architecture, the fame of Michael Angelo is identified with the noble Basilica of St. Peter's. The site of the original building is supposed to have been the Circus of Nero, where the primitive Christians were burnt, crucified, and devoured by wild beasts. Tradition reports that their mangled remains were collected by the pious hands of their co-religionists, and buried under the Vatican Hill, in what has been called the Vatican Cemetery; and here St. Peter is presumed to have been buried. In honourable memory of these early martyrs, Constantine the Great, on his conversion to Christianity, demolished the circus, and, at the request of St. Sylvester, Bishop of Rome, erected the first basilica. His zeal prompted him to work at the foundations, and he carried away on his shoulders twelve baskets of earth in honour of the twelve Apostles. The walls of the circus were employed in the construction of the basilica; marble was procured from several of the ancient structures, and one hundred columns adorned the new edifice. On the 18th of November, in the year 324, it was consecrated by St. Sylvester. Succeeding popes, emperors, and kings embellished and enriched it; and, had its constantly accumulating treasures escaped the hand of rapine, it would have exceeded in riches even the opulent temples of antiquity; but it shared in the frequent desolations of the city. Mr. Salmon, the antiquary, has mentioned several of the costly gifts it received, and the names of the donors. In the year 460, St. Hilarius gave to it two gold vases set with jewels, fifteen pounds weight each, ten chalices, and twenty-four lamps of silver; St. Simplicius gave twelve more, and a vase of gold weighing sixteen pounds; Simmacus twenty more, and twenty-two arches of silver, each weighing twenty pounds. Hormisdas had a silver beam made, of 1400 pounds weight, to sustain the lamps that burned night and day before the tombs of the Apostles. Pelagius II. adorned the tomb with silver, and St. Gregory added a canopy with silver

columns, each weighing 180 pounds. Honorius I. had the silver doors made, of 975 pounds weight, and covered the roof with sheets of gilt metal taken from the Temple of Jupiter Capitolinus. Adrian I. had a lamp made, in form of a cross, with 1360 branches, that were lighted four times in a year, and adorned the confessional or tomb with 1328 pounds of gold. Leo built a tower then unequalled; but after this basilica was stripped of its treasures by foreign enemies, Leo IV. had new doors made, with some basso-relievos in silver. Nicholas III. adorned it with mosaic-work; and Giotto executed many works for its embellishment. In the course of time, after various disasters, the original basilica was falling into ruins, and under the pontificate of Nicholas V., about the year 1450, it was perceived that the walls were giving way. That pope entertained the design of taking down the old church, and even began operations for replacing it by a modern structure, but nothing effective was accomplished. At length, after the old basilica had existed during 1200 years, Pope Julius II., in 1506, resolved on erecting the new St. Peter's, without doubt the noblest temple in the world; and on the 18th of April, 1508, the foundation-stone of one of the vast pillars that support the dome was

laid by Julius in person, with imposing pomp and ceremony. The first architect was Bramante, who, on his death, was succeeded by his illustrious nephew, Raffaello Sanzio, of Urbino, who was followed by Baldassare Peruzzi. The sack of Rome by the Duke of Bourbon, under Pope Clement VII., interrupted the work. Under Paul III. it was carried on by San Gallo, and then by Michael Angelo. In 1564, the continuation of the structure was entrusted to Vignola. In 1573, Giacomo dell Porta and Domenico Fontana, under the pontificate of Sixtus V., raised up the wonderful cupola from the model left by Michael Angelo, a little larger than that of the Pantheon; and to complete the small cupola, added a ball of metal that supports the cross,—the concavity of which ball, Mr. Salmon asserts, contains commodiously thirty-two persons sitting. Nearly three centuries elapsed, and thirty-five pontiffs reigned, from the commencement to the completion of this stupendous fabric. The cost has been computed at twelve millions sterling.

It was in 1546, on the death of Antonio San Gallo, that Pope Paul III. appointed Michael Angelo superintendent of the fabric of St. Peter's; but the great architect made it a condition that he would receive no pay or other reward for time or labour. He felt it a religious duty to dedicate his genius to the magnificent temple which piety was erecting to the Supreme Being, from whom his genius was derived. He rejected a plan prepared by San Gallo, and made a new and original design. The four principal piers constructed by Bramante he discovered to be too weak, and strengthened them. Two spiral staircases, which he modelled, were of such easy ascent, and so slightly inclined, that the asses used in carrying the materials to the summit of the building could mount and descend them, while men rode up on horseback to the platform of the arches. The curious reader is referred to Vasari for copious details of Michael Angelo's architectural contributions to St. Peter's, and also for an account of his skill in erecting St. Lorenzo, at Florence, the fortifications of that city, and his various plans in military engineering.

It is worthy of remark that few of his works undertaken in manhood were ever completed, those entirely finished being the productions of his youth. "Such, for example," says Vasari, "were the Bacchus, the Pieta of the Madonna dell Febbre, the colossal statue at Florence (the David), and the Christ of the Minerva, which are finished to such perfection that a single grain could not be taken from them without injury; while the statues of the Dukes



VIRGIN AND CHILD, BY MICHAEL ANGELO.





Giuliano and Lorenzo,* with those of Night, Aaron, Moses, and the two figures belonging to the latter, altogether not amounting to eleven statues, have still remained incomplete. The same may be said of many others; nay, Michael Angelo would often remark that if he were really compelled to satisfy himself in the works to be produced, he should give little or nothing to public view. And the reason of this is obvious: he had proceeded to such an extent of knowledge in art, that the very slightest error could not exist in any figure without his immediate discovery thereof; but having seen such after the work had been given to view, he would never attempt to correct it, and would commence some other production, believing that the like failure would not happen again; this then was, as he often declared, the cause wherefore the number of pictures and statues finished by his hand was so small."

It was the good fortune of this illustrious man to be estimated during his life at his proper value, for his contemporaries recognised

dependents. The poor enjoyed his bounty; and he made it a rule to give dowries to poor girls. He lived a life of honour, and no vice sullied his fair fame.

The next illustrations of art in the Italian Court to which we shall refer, are taken from the works of the Florentine sculptor, Jacopo Sansovino. He was descended from the Tatti family, originally of Lucca, but who established themselves at Florence in the year 1300. At an early age, Jacopo became the pupil of the celebrated Andrea Contucci, of Monte Sansovino, a place near Arezzo, between whom there grew up and strengthened so warm an attachment, that they were regarded as father and son; hence Jacopo dropped the name of Tatti, and took that of Sansovino. Giuliano da San Gallo, struck by the early genius of Jacopo, took him to Rome; and under this patron, who was one of the architects of Julius II., the young man studied the statues in the Belvedere. He was also encouraged by the famous Bramante, for whom he



VESTIBULE OF THE ITALIAN COURT.

his exalted genius. Too many have only been appreciated after death, and posthumous honours have been paid to those who wanted bread while they were benefiting society. Michael Angelo enjoyed the favour of seven succeeding popes—Julius II., Leo X., Clement VII., Paul III., Julius III., Paul IV., and Pius IV. Rival sovereigns competed to give him a princely home—Solyman, Sultan of Turkey, Francis, King of France, the Emperor Charles V., the Signory of Venice, and Duke Cosmo di Medici of Florence.

The character of Michael Angelo was singularly dignified and independent, in an age when the power of princes was unlimited; and he even had the courage to brave the resentment of the fierce Julius II. He was free from envy and avarice. Rising merit found in him a generous patron; and he provided liberally for his

modelled figures in wax, from which bronze casts were taken. These he executed in competition with other artists, and Raffaello pronounced them the best. Ill health compelled him to quit Rome for Florence, where he distinguished himself by his marble "Venus reclining on a Shell," and the "Boy with a Swan." He is particularly famed for his draperies, on the folds and edges of which he bestowed the most elaborate finish. But his great reputation rests on the works he executed at Venice, to which city he repaired after the sack of Rome by the Duke of Bourbon. Here he constructed the beautiful Library opposite the Ducal Palace, and the Delfino, and Moro, and Comaro Palaces; and the Zecca, or Mint, which is a masterpiece in architecture. To him Venice was also indebted for the beautiful Loggia, of the Corinthian order, erected round the Campanile of St. Mark's.

In the Italian Court are seen copies from this grand edifice, representing the open worked panels from the bronze doors of the

* This is a mistake: these two statues are finished, as are the allegorical figures which accompany them (see note in Bohn's edition of Vasari, vol. v. p. 313).

Loggia. The Loggia is richly decorated with columns, and four bronze figures stand in niches; in addition to these are various figures and stories in basso-relievo by the hand of Jacopo. The Loggia forms a basement to the Campanile, or Bell Tower, which itself is 292 feet high. The figures are female, and allegorical. That of War rests on a shield, helmeted; that of Peace holds the caduceus of Mercury. The angles are ornamented with the winged lions of St. Mark. The bronze door of St. Mark's is said to have occupied Sansovino for nearly thirty years. In one panel is depicted the entombment of Christ, in the other the resurrection. The bronze statues which ornament the niches of the façade of the Italian Court are also by Jacopo Sansovino. The façade itself is copied from the Farnese Palace, at Rome, which Pope Paul III. commenced when he was a cardinal, from a design of San Gallo; and it was finished by Cardinal Alexander Farnese, from a design by Michael Angelo, except the southern portion, which is by Giacomo dell Porta. The stones used for building it were taken from the Flavian Amphitheatre and the Theatre of Marcellus. The chief entrance to this noble palace was adorned with twelve columns of Egyptian granite, and with the same number of Travertine stone columns, forming a grand division in ten niches, and four doorways. The quadrangle is surrounded with double porticoes, designed by Michael Angelo. The Farnese family drew from the ruins of the Baths of Caracalla and the Flavian Amphitheatre many masterpieces of ancient sculpture, statues, reliefs, and coloured marbles, to decorate their palatial residence—such as the Hercules and the Toro Farnese, otherwise called the Dirce, which has been described in the Roman Court.

The Library of St. Mark, at Venice, is a noble monument to the fame of Jacopo Sansovino, and has served as a model for the Carlton New Club House, in Pall Mall. The Venetian authorities ordered its construction, regardless of expense, and thus gave free scope to the genius of the architect, who responded to the generosity of his munificent patrons by producing a marvel of beauty. Sansovino used the Doric and Corinthian orders, with fine carvings, columns, capitals, cornices, half-length figures, and other decorations; but the stucco-work, which formed compartments for paintings, was executed by Alessandro Vittoria of Trent, a pupil of Sansovino, who excelled in marble portraits. Over the parts thus divided, Battista Franco of Venice painted minute *groteschines*, and in the larger spaces a considerable number of figures in fresco. He also decorated the ceiling of the vestibule to the staircase.

The *Zecca*, or Mint of Venice, was considered, at the time it was built, the most perfect treasury in the world, being constructed entirely of iron and stone, to the complete exclusion of the least particle of wood. It was, of course, fireproof. Sansovino revolutionized the architectural style of Venice, which, before his time, had been marked by a tame uniformity. He not only added to the beauty of the city, but greatly improved its sanitary condition by several ingenious contrivances, especially in the markets, largely increasing the tolls, without pressure on the dealers or their customers. Vasari thus sums up his merits as a sculptor:—"The judges of art affirm that, although yielding on the whole to Michael Angelo, yet Sansovino was the superior of that artist in some points. In his draperies, in his children, and in the expression which he gave to his women, for example, Jacopo has no equal. The draperies, indeed, by his hand are most delicately beautiful; finely folded, they preserve to perfection the distinction between the nude and the draped portions of the form. His children are soft flexible figures, with none of the muscular development proper only to adults; the little round legs and arms are truly of flesh, and in nowise different from those of nature itself. The faces of his women are sweet and lovely; so graceful, withal, that none can be more so, as may be seen in certain figures of the Madonna, in those of Venus, and in others by his hand."

In the third period of the Renaissance the beautiful art of engraving on cameos and precious stones, which the Greeks had carried to perfection, was restored to the highest excellence by Italian genius. This art had been lost on the destruction of imperial Rome, but in its ruins many fine specimens were discovered, and some feeble attempts had been made to revive the practice by imitating the recovered gems in the reigns of Pope Martin V. and Pope Paul III. When treating of the Renaissance Court, we noticed the progress made in this department of art at Florence, under the patronage of Lorenzo di Medici, by Giovanni delle Corniule and Domenico de' Cameli. During the pontificate of Leo X., Pier Maria

da Pescia and Michelino successfully copied some of the finest cameos of antiquity; and, at a later date, Giovanni da Castil, a native of Bologna, Valerio Vicentino, and Matteo del Nassaro carried this branch of art to perfection.

Among the admirable works of the first of these artists, was an intaglio on crystal, describing the Battle of the Rampart, and a cameo, on which he executed the Rape of the Sabines. For Pope Clement VII., he engraved the four Evangelists on four round crystals. He made a portrait of the Emperor Charles V. in steel. He wrought with as much facility as beauty, and designed and engraved a great number of subjects, scriptural, mythological, and historical. He died in 1555.

Valerio Vicentino enjoyed the liberal patronage of Pope Clement VII., and all the goldsmiths in Florence competed for his productions, which they forwarded to all parts of Europe. His medals of the twelve Cæsars, his crystal crosses and caskets, and his varied engravings on all kinds of stones, have been pronounced marvels of art.

Matteo del Nassaro was hardly inferior to either of his great contemporaries. His Deposition from the Cross, executed on a piece of green jasper, marked with red spots, has been highly praised; he cleverly contrived that the wounds should appear on the parts where the stone was so spotted. The head of Dejanira, on a chalcedony, has been warmly eulogised by his biographer. The work was in full relief, and the head wrapped in the skin of the lion; in the stone there was a vein of a red colour, and there the artist made the skin turn over at the junction of the body with the head, and the skin was represented with so much exactitude, that the spectator imagined himself to behold it newly torn from the animal. Of another mark in the stone he availed himself for the delineation of the hair, and selected the white parts for the face and breast.

These engravers on precious stones were followed by Luigi Anichini, a native of Ferrara, who established himself in Venice; and by Alessandro Cesati, called Grechetto, on account of his always writing his name in Greek characters on his works. Of this latter, Michael Angelo entertained so high an admiration, that on seeing one of his medals, representing the portrait of Paul III., with the reverse exhibiting Alexander the Great doing homage to the high priest of Jerusalem, the great sculptor exclaimed, "The hour for the death of art has arrived, since a better work cannot be executed."

The most skilful of the engravers was Benvenuto Cellini; not only was he eminent in cutting precious stones, but scarcely excelled by any of his contemporaries in casting in bronze, and sculpturing marble statues. His statues of Perseus and Ganymede, copies of which are exhibited in the Italian Court, are monuments of his fame, to which we shall presently return. In his curious and instructive autobiography, he states that the peasants of Lombardy used to seek employment in the vineyards surrounding Rome at a particular season of the year, and, in digging the ground, frequently discovered ancient medals, agates, cornelians, and cameos; finding also precious stones, such as emeralds, sapphires, diamonds, and rubies. These diffused a taste for the art of engraving, and Cellini says that the purchases he made from the peasants procured him the friendship of most of the cardinals to whom he sold them. He selects for special commendation many of those antiques. One was a dolphin's head, about the size of a large bean; another, a most beautiful topaz, on which was carved the head of Minerva. A cameo representing Hercules binding a triple-headed Cerberus, was so admirable that Michael Angelo declared that he had never seen anything that surpassed it. By a careful study of such models, the engravers of the sixteenth century soon rivalled the Greeks in skill, and Cellini himself perhaps surpassed them. He was employed by Pope Clement VII., by Francis I. of France, and Cosmo di Medici, Duke of Florence. In his youth he excelled in medals, and in engraving on precious stones. During the pontificate of Clement VII. he was employed at the Roman Mint, and his coins were the finest ever struck. A button that he made for the pontifical robe, with a diamond fixed upon it, and encircled by figures of children, was deemed a perfect gem; as also a golden chalice, the cup of which was carved with figures representing the theological virtues. Francis I. treated him with the most munificent liberality. For that monarch he made a silver Jupiter, standing on a bronze base, enriched with various ornaments, the most conspicuous of which, in basso-relievo, were on one side the Rape





of Ganymede, and, on the other, Leda with the Swan. Cellini also designed the palace gate at Fontainebleau and the fountain. For the Duke Cosmo of Florence he executed in metal the "Perseus," which is his masterpiece. The hero is represented cutting off the head of Medusa. It was placed in the Piazza, at Florence, on a line with the "Judith" of Donatello, and when first exhibited in public, excited universal admiration. It is indeed an exquisite and extraordinary performance. The "Ganymede" is not an original statue, but a restored statue. It was sent from Palestrina to the Duke Cosmo, who asked Cellini's judgment on its value. The sculptor praised it highly, and, as it was in a very mutilated condition, undertook to restore the head, arms, and feet, and make an eagle for it. Such is the history of the Ganymede. Cellini's "Christ upon the Cross" is also a noble testimonial to his skill. It was a Christ crucified of the whitest marble upon a cross of the blackest, and as large as life. He intended to give it to the Church of the Nunziata, and under it constructed his own tomb. The Duke Cosmo, however, bought it, and placed it in the Pitti Palace, in 1565. It was afterwards sent as a present to Philip II. of Spain, who set it up in the Church of the Escorial, as an ornament to the choir. Cellini's career was marked by extraordinary adventures, and Horace Walpole pronounced his autobiography more amusing than any romance. He was cruelly imprisoned in the Castle of St. Angelo, from which he made a wonderful escape. When the Duke of Bourbon assaulted Rome, Cellini had charge of a portion of the artillery, which he served with skill and courage. He fired the shot which killed the Prince of Orange, and claims also the honour of killing the Duke of Bourbon.

In the interior of the Italian Court will be observed a bas-relief by Baccio Bandinelli, taken from the choir of Florence Cathedral. It represents an Apostle. In the cathedral all the Apostles and figures of the virtues are represented. The expression of the heads is fine. This sculptor was born in 1487, and died in 1559. He was among the most eminent of his day, but his character was debased by envy. He was meanly jealous of Michael Angelo and Cellini, and hated them with bitterness. He restored the arm of the antique "Laocoon," and also executed a copy of that celebrated statue. Another of his great works was "The Martyrdom of San Lorenzo," who was roasted to death, and which so pleased Pope Clement VII. that he ordered Marcantonio of Bologna, to engrave it on copper. The masterpiece of Bandinelli was his "Hercules and Cacus." The head of Cacus is compressed between two stones; Hercules presses it firmly with one knee, while he keeps his opponent down with his left arm, using immense force, and retaining his antagonist in an attitude of which the painful agony is rendered manifest; the legs are violently drawn up by the extremity of pain, and by the weight of Hercules, which bears on his struggling enemy with a violence that causes every muscle in the frame of Cacus to appear strained to bursting. The figure of Hercules, bent down, is seen with his head brought near his foe; grinding his teeth, which are firmly pressed together, he raises his right arm, and, fiercely dealing Cacus a second blow, is about to dash his skull to pieces with his club. Lucretia Salviati, sister of Leo X., commissioned Bandinelli to erect the monument of that pontiff, from a model which he had made in the pontificate of Clement VII., and which he completed in the Church S. Maria Sopra Minerva.

Engraving in copper was carried to a high state of excellence in this last period of the Revival. "The art of engraving," says Algarotti, "is contemporaneous with, and has like beneficial effects with that of painting. Every painter should have in his studio a collection of the prints of the best engravers, from which he may learn the progress and history of his art, and gain acquaintance with the characteristics of the various styles which have from time to time been most in favour. The chief of the Roman school, himself, did not disdain to study carefully the engravings of Albert Durer, or to make as complete a collection as possible of drawings from the antique statues and reliefs."

"An engraving," says M. Guizot, "is by no means a copy in the strict sense of the word, because the engraver has not the same means at command as the sculptor and painter, and therefore cannot produce the same effects; it has been called a *translation*, a comparison which appears to me much more exact, although it is not approved by some who are good judges; for the engraver does in fact speak a different tongue from the painter, since he addresses the eye in a different manner; like other translators, he

is bound to adhere scrupulously to the forms and style of his original, and, indeed, he has the advantage over them, that his version is more literal than any verbal one. To carry on this comparison to its limits, we may say that the engraver having, like all translators, the disadvantage of not being able to render the spirit and magic of his original, must do all he can to preserve its character. And this, while it is that which he must seek to do, is also within his power; his means of effecting it are drawing, and contrast of light and shade."*

Whether the art of engraving on copper originated in Italy or in Germany seems doubtful. Vasari claims the invention for his countrymen, and attributes it to Maso di Finiguerra, about the year 1460. He was followed by Baccio Baldini, at Florence, and Andrea Mantegna, at Rome. Martin Schon cultivated the art with great success at Antwerp. He was followed by the celebrated Albert Durer, who also excelled in woodcuts. Of him Raffaello said, "Of a truth this man would have excelled us all, if he had had the masterpieces of art constantly before his eyes as we have." Lucas of Leyden was one of his contemporaries, and arrived at great eminence; while, in Italy, Marcantonio Raimondi diligently studied the method of Durer, and so accurately copied that master's Life and Passion of Christ, in thirty-six plates, that it passed off as an original. Marcantonio engraved many of the paintings of Raffaello, as the Judgment of Paris, the Slaughter of the Innocents, the Rape of Helen, and the Galatea; and, after Raffaello's death, he engraved many of the works of Giulio Romano. Ugo da Carpi was famous at this epoch, using two blocks or plates; one of these he used in the manner of a copper-plate for etching in the shadows, while he gave the tint or colour with the other. Succeeding in this manner, he experimented with three blocks. "With the first," says Vasari, "he made the shadow; from the second, which was of a somewhat paler hue, he obtained the middle tint; and the third, being etched, supplied the brightest colour of the picture, and gave the lights of the white paper." Vasari also describes the method of Antonio of Trent; he engraving with the aid of *aqua-fortis*, first covering the copper-plate with a coat of wax, varnish, or oil, and then designing the subject to be engraved with a sharply pointed instrument; this cut through the wax, varnish, or oil, as the case might have been, when the *aqua-fortis* being poured over all, corroded the copper in such sort that the strokes of the drawing remained hollowed; after this process it was easy to take impressions.

Returning to the exterior of the Italian Court, we notice a statue of the Virgin, by Pietro Lombardo, the Venetian sculptor, taken from the Church of the Frari, at Venice. In her right hand she holds a small asp, and her feet are furnished with antique symbols. This sculptor executed the monuments of the Doges Pietro and Giovanni Mocenigo, and the beautiful tomb of Cardinal Zeno.

Opposite to this statue is the "Bacchus" of Jacopo Sansovino, which he executed for Giovanni Bartolini, at Florence. It is a youthful figure, of the size of life, and the sculptor took for his model one of his disciples, named Pippo del Fabbro, or the "Blacksmith's Joe," whom he kept standing naked the greater part of the day. This Pippo, in the judgment of Vasari, would have become an able artist, had his life been prolonged, but constant exposure to the cold in a state of nudity prematurely destroyed his health; for as his master was indefatigable in his labours, the youth was constantly unclothed. The Bacchus is a masterpiece. There was this peculiarity in it—one arm being fully detached and raised in the air, while a tazza, cut from the same piece of marble, is held aloft in the hand, or, rather, so delicate and subtle is the work of the fingers, whereon it is so lightly poised, that they scarcely appear to touch it.†

To the right of Sansovino's Bacchus is a "Triton," taken from a fountain in the gardens of the Doria Palace, at Genoa, executed by Fra Giovanni Agnolo Montorsoli. His father was a small farmer. As the bent of the boy's genius soon showed itself, he was sent to carve stone in the quarries of Fiesole, and then placed under the instruction of the sculptor, Andrea di Fiesole. When quite a youth, Montorsoli had the courage to offer his services to Michael Angelo, by whom they were encouragingly accepted. The great master at once recognised his talents, and paid him the salary of a man. At this period of his life, Montorsoli worked at the buildings

* The Fine Arts: their Nature and Relation. By M. Guizot, p. 44.

† Vasari.

of the sacristy and library of San Lorenzo, at Florence, which were discontinued in the year 1527, when the plague broke out. He then entered the hermitage of Camaldoli, but, unable to conform to the austere discipline there enforced, he quitted that retreat, sought an asylum in the Jesuit's convent at Florence, soon left it, and assumed the monastic habit among the Servite monks, in the year 1530. Michael Angelo, being at Rome, in the service of Pope Clement VII., who had ordered the works of San Lorenzo to be continued after the cessation of the plague, remembered Montorsoli, but as he was now a monk, it was difficult to obtain his services. It required the interference of the pope, whom the general of Montorsoli's order could not disobey, though he consented with an ill will. This circumstance is here mentioned as showing the power of the monastic institutions at that period. The young monk had apartments assigned to him at Rome, and there he restored the left arm

marble columns and pavements, and profuse embellishments in precious stones. At Genoa, he constructed a fish-pond in front of the Doria Palace, where he placed the Triton, a copy of which is in the Italian Court. At Messina, he erected a fountain on the Piazza, on a very grand scale, ornamented with river gods—as the Nile, the Tiber, the Ebro; Pegasus, the stamp of whose hoof on the ground produced the Fount of Castaly; Arethusa turned into a fountain; Jason traversing the Euxine, in search of the golden fleece; Europa carried across the Bosphorus by Jupiter Tauriform; Diana surprised in the bath, and turning Actæon into a stag for looking at her nude person, and other old fables of a similar character, are represented at this fountain. There also are seen, in another compartment, Scylla and Charybdis; and on the summit is a figure of Orion, the mythological founder of Messina. Comparisons may be odious, but they are sometimes instructive, and we have alluded to the



TOMB OF GIULIANO DI MEDICI.

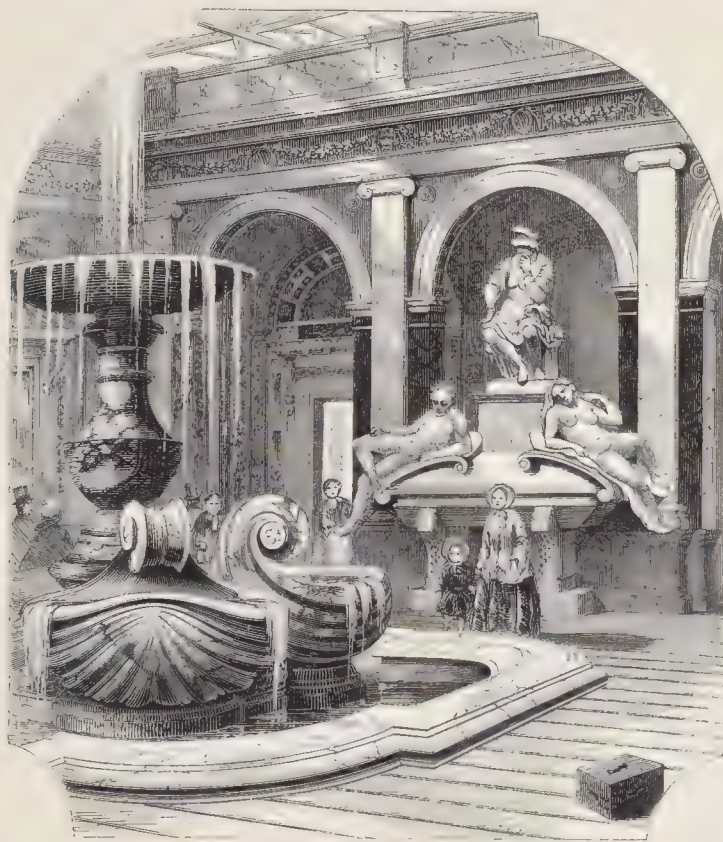
of the "Apollo," and the right arm of the "Laocoon." He won the personal favour of the pope by executing a capital likeness of him in marble. Shortly afterwards, he accompanied Michael Angelo to Florence, whom he assisted in completing the statues of the dukes Lorenzo and Giuliano, in the famous monuments we have described. He then sculptured the figure of Duke Alessandro in armour, commending himself to the protection of the Madonna. These works accomplished, he went into the service of the King of France, but soon quitted that kingdom. For the Neapolitans he built the tomb of Sannazaro, the poet, which was highly admired. He was next invited to Genoa, to complete the statue of Prince Doria, which Baccio Bandinelli had commenced, but left unfinished; and the Signoria of that city commissioned him to construct a sepulchral monument for that prince, to be placed in the Church of St. Matthew; he also decorated that church with rare magnificence, introducing

details of the fountain, executed in a small town, to show what taste and munificence opulent London has displayed in Trafalgar Square.

There are circumstances connected with the life of Montorsoli, irrespective of his profession of architect and sculptor, which deserve notice, as they serve to throw light on the spirit and practice of the Roman Church in the age in which he lived. His biographer states that the artist monk, on returning to Rome from Genoa, purchased for himself the dignity of a knighthood of San Pietro, and commissioned his nephew to buy for him the knighthood of the Lily, to which last purpose he appropriated one thousand crowns; and the Grand Master of Rhodes offered him a knighthood in Malta, if he would reside in that island, which he declined. In the year 1557, during the pontificate of Paul IV., all who had left their monasteries were compelled to return to them under severe penalties, and, of course, Montorsoli was included in that decree. Accordingly, he

resumed the habit of his order; but the papal edict does not appear to have been very rigidly enforced, for we soon find him at Bologna directing the construction of the high altar in the Church of the Servites, to which religious order he belonged. He then obtained a dispensation from his brethren to erect in the chapter-house of the Nunziata—which he had previously adorned with stucco figures of Moses and St. Paul—a beautiful sepulchre, destined for his own tomb, and for such other persons professing the arts of design,—painters, sculptors, and architects,—who were unprovided with a burial-place of their own. He bequeathed his property to the monks on the condition that, at certain festivals, they should perform mass for the good of the souls of those interred in the chapter-house. Montorsoli died in 1563.

The Cathedral of Pisa, in which John of Bologna executed his bronze doors, is rich in artistic productions. It contains some of the best pictures of Domenico Beccafumi: as that of Moses, who, having found the people offering sacrifice to the golden calf, throws down the tables of the law and breaks them; another, also taken from the history of Moses, represents the Hebrew legislator at the moment when the earth opens to swallow up a part of the people, in which the nude figures are lying dead. He also painted the four evangelists in this cathedral. It was also enriched by the chisel of Tribolo, who there sculptured an angel for Stagio di Pietra, a famous master, then employed by the wardens on two columns, with marble capitals, very richly executed, above which several angels were placed. That of Tribolo was admirable. A graceful move-



TOMB OF LORENZO DI MEDICI.

In the Italian Court are two specimens of the skill of John of Bologna, a native of Douay, in Flanders, but named Bologna on account of a celebrated fountain he erected in that city. The specimens are a bronze statue of "Mercury," and a bronze "Door at the Cathedral of Pisa." The Mercury is in the act of flight, the whole figure resting on the point of the foot. Vasari says that it was sent to the Emperor Maximilian, but this is contradicted by his English translator in the notes. It has been supposed by some that the Mercury which, for so long a time, adorned the fountain of the Villa Medici, and is now in the Florentine Gallery, was a replica, but no doubt it is the original work. At Bologna, this sculptor also executed a "Victory with a Captive," which was erroneously attributed to Vincenzio Danti. It stands in the hall of the Palazzo Vecchio, at Bologna. The model is in the court of the Florentine Gallery.

ment is given to the figure; the texture of the draperies is almost transparent, and they are folded round the body with the ease of nature. Perhaps the bronze doors are the most beautiful objects in the building, on which are represented several incidents in the life of Christ. He is there seen bound and shown to the Jews; he bears his cross; he is crucified; in another compartment, the Saviour is brought bound before the high-priest; in the second, he is crowned with thorns; in the third, he is scourged. The whole is treated in a masterly style; the grouping is judicious, the action spirited.

We have mentioned the Pietà by Michael Angelo, and now refer to that of Bernini.* The positions are very different. In the former, the dead Christ rests on the knees of the Virgin mother, one arm encircles his back and supports his head, the other, placed under

* See Engraving, p. 96.

the knee, raises the leg. In the treatment by Bernini, the Virgin is standing, one hand presses the head of Christ, which falls on his shoulder, the other is extended over the body, which it does not touch. In both, the expression in the countenance of the Madonna is fraught with profound grief. Michael Angelo, prior in date, of course had the choice of attitude, and he has selected the most appropriate; nevertheless, Bernini, not a copyist, but a rival, has some advantage in the erect figure of the Virgin, that of Michael Angelo being seated.

Bernini was born in 1589, therefore by birth he belongs to the sixteenth century, but, as an artist, to the seventeenth. He achieved great success as a painter, a statuary, and an architect. Nature had been bountiful to him in many of the gifts of genius, but he failed in judgment, or perhaps the impetuosity of his mind disdained the rules of art and the severity of criticism. He worked with great facility, but seemed to forget that labour is the price to be paid for excellence in every department of industry, be it intellectual or mechanical; hence he was more brilliant than profound. It was unfortunate for him that he excited admiration while yet a little boy, for he executed the head of a child, in marble, when only eight years of age. For this he was caressed and spoiled. He was not eighteen years of age when he produced the "Apollo and Daphne," which is a masterpiece of grace and execution; and in his old age he used to say that he had but slightly improved on that performance. As an architect, he was employed on the Basilica of St. Peter's. Among his numerous works were—the Barberini Palace, the Belfry of St. Peter's, the Model of the Monument of the Countess Matilda, and the Monument of Pope Urban VIII., and the Great Staircase between St. Peter's and the Vatican. By the order of Pope Alexander VII., he designed a plan for beautifying the Piazza di San Pietro; after which the celebrated colonnade was built, which, with its entablature, balustrade, and statues, is seventy feet high. In this work he indulged his fancy, disdained precedents, and invented a new composite, which a discriminating criticism has justly condemned as incongruous. It has been well remarked by Eustace, "surely, the pure Doric of the Parthenon, the Ionic of the Temple of Fortuna Virilis, and the Corinthian of the Pantheon, might have been adopted with more propriety and effect, than a fanciful combination of irregular Doric pillars and an Ionic entablature." Bernini's reputation was not confined to Rome, Cardinal Mazarin offered him a salary of twelve thousand crowns if he would reside at Paris, which he declined; but, in his sixty-eighth year, he accepted an invitation from Louis XIV. His reception at Versailles was most gracious and flattering; but his stay was short. In his seventieth year he executed the tomb of Pope Alexander VII., a very fine performance. He died at the age of eighty-two.

In describing the Renaissance Court we spoke of Torrigiano, and narrated the principal incidents in his life. The central statue in the gallery of the Italian Court is the "St. Jerome" of that artist, considered his masterpiece. It was executed for a monastery belonging to the monks of St. Girolamo, near Seville, in Spain. The head is finely expressive, and the anatomy of the whole figure has been highly praised. The extreme emaciation, however characteristic of the saint, and however creditable to the skill of the sculptor, is repulsive, or, at least, it excites no pleasurable emotion in the spectator.

About the exterior of the Italian Court and Vestibule, a variety of busts have been grouped, giving the likenesses of the leading men of the epoch, who contributed to the improvement of art, and these require a passing notice. As we have already spoken of Michael Angelo, we may pass from his portrait sculpture to that of Palladio. This celebrated architect was born at Vicenza, in 1518. His earliest studies were devoted to sculpture, but after he had visited Rome, stored his mind with the precepts of Vitruvius, and examined the ancient monuments, he commenced the profession in which he achieved an enduring fame. There is an intellectual character in his designs, which stamps them with marked characteristics. He greatly embellished his native city, completing the town-hall, and building the Olympic Theatre—a classical edifice, modelled after the ruins and descriptions of the ancient theatres of Italy. At Venice he constructed the churches of San Giorgio Maggiore and Il Redemptore, remarkable for harmony of proportions and simplicity of decoration. He is noted for the peculiar taste with which he arranged pyramidal forms, but is blamed for overloading his doors and windows with architectural ornament. But, with slight imperfections, his style was majestic and

chaste, and Algarotti calls him the Raffaello of architecture. He published an esteemed work on Roman antiquities, and died in 1580.

The two next busts are those of Raffaello and of Sir Christopher Wren, the boast of English architecture. Of the great Roman painter mention has already been made. The father of Wren, of Danish extraction, was Dean of Windsor, and the son was educated at Oxford, where he made great progress in the most abstract branches of science. In 1657, he became Professor of Astronomy at Gresham College; and after the restoration of Charles II., he was appointed Savilian Professor at Oxford. He was knighted in 1674, an honour of more dignity than at present. In 1680, he was raised to the honourable office of President of the Royal Society, and in 1685, entered parliament as member for Plympton. He communicated many scientific papers to Mr. Wallis, the eminent mathematician. He lived to the advanced age of ninety, respected for his private virtues, and admired for his extraordinary genius. After the Great Fire of London, he proposed a plan for rebuilding the metropolis, which posterity has regretted was not carried into effect. He is known throughout the world as the architect of St. Paul's Cathedral, under whose dome his mortal remains repose.

The busts on the left, as the spectator looks towards the Nave, are those of Charles I. of England, and Cardinal Richelieu. The reign and death of the English king are too well known to require any details. He took a wrong view of the prerogative, was insincere, and formed a false estimate of the spirit of his age. The bust is attributed to Le Sueur, who erected the Charing Cross statue.

Armand Jean Du Plessis, Cardinal Richelieu, was born in 1585, and when twenty-two years of age obtained the bishopric of Luçon. He was a man of subtle and intriguing character, and had no moral scruples as to the means he adopted to carry out his end. He wielded despotic power, and ruled through the agency of spies. His vengeance was merciless, and his cruelty appalled the boldest. He humbled the nobility without elevating the middle class, and rendered royalty despotic. An enemy to religious, as well as to civil liberty, he persuaded Louis XIII. to depart from the generous policy of Henry IV., and wreaked vengeance on all who dissented from the Church of Rome. He attacked Rochelle, the stronghold of the Protestants, commanding in person the besieging army; erected an immense mole, which enabled him to intercept all supplies from England, and finally reduced it by famine. Such was his influence over the king, that he prevailed upon him even to banish the queen-mother from the court, and he brought the head of the illustrious Duke of Montmorency to the block. In fact, it was he who, after annihilating the once formidable authority of the great vassals of the crown, prepared that absolute monarchy and that suppression of the states-general, which made Louis XIV. the irresponsible autocrat. His foreign policy was as vigorous as his domestic. To humble the house of Austria he assisted the King of Sweden, though a Protestant, in the Thirty Years' War; and abandoned him in the full career of victory, lest he might become too powerful. In 1659, he waged war against Spain, from which country he wrested Catalonia and Roussillon; and assisted Portugal to separate itself from Spain, and place its crown on the head of the Duke of Braganza. Moralists must condemn his policy, yet it may be confessed that he raised France, as one of the European powers, to the summit of grandeur, and made her the arbiter of the continent.

The next bust is that of the celebrated English architect, Inigo Jones, born in 1572. He early distinguished himself in landscape painting, and thus gained the patronage of the Earl of Pembroke, who enabled him to complete his artistic education by travelling over Italy and some other parts of Europe. While at Venice, where his genius was highly appreciated, he received an invitation from Christian IV., King of Denmark, to become his royal architect, which appointment he accepted. The Princess Anne, sister of that king, had married King James I. of England, and when Christian visited her in 1606, Jones accompanied him, intending to remain in his own country. He became the queen's architect. He paid, however, a second visit to Italy; and on his return became surveyor-general of his majesty's works, and in 1620 was nominated one of the commissioners for repairing St. Paul's Cathedral. King Charles I. retained him in his office. After the execution of that monarch, he was cited before the House of Peers, on the complaint of the parishioners of St. Gregory's, in London, for injuries done to that church in repairing St. Paul's. Being a Royalist and a

Romanist, he had small chance of obtaining justice at that eventful period. In his defence he incurred heavy expenses, and was fined £545 for his imputed delinquency. These losses he never recovered, though, after the Restoration, Charles II. gave him back his appointments, but they were no longer lucrative, nor did he long survive. His great architectural works were the Banqueting House, Whitehall, the ceiling of which was painted by Rubens; the new buildings in front of what were the gardens of Somerset House, and the Church and Piazza of Covent Garden, the latter incomplete to this day. He laid out Lincoln's-Inn-Fields, and built the garden front of Wilton House, the seat of the Earl of Pembroke; the Queen's House, at Greenwich; the Grange, in Hampshire, the seat of the Earl of Northampton; Cashibury, in Hertfordshire, and Gunnersbury, near Brentford. The style of Inigo Jones was founded on that of Palladio.

The next bust is that of Cardinal Mazarin, an Italian by birth, but educated at the Academy of Alcalá, in Spain. On his return to his native country, he studied jurisprudence. In 1634, he was sent by the pope as nuncio to Paris; and so won the esteem of Cardinal Richelieu, that that minister, on his dying bed, recommended Louis XIII. to nominate the foreigner as his successor. The king did so, but soon followed Richelieu to the grave. Anne of Austria was appointed regent during the minority of Louis XIV., and the crafty Mazarin fully ingratiated himself into her favour, and ruled France in her name. During the civil war called the "Fronde," he was driven from Paris, but returned in triumph when it was crushed, and death alone deprived him of his undisputed supremacy.

The last of these busts is from the statue of Santa Susanna, deemed the masterpiece of Fiammingo, from the Church of Santa Maria di Loreto, at Rome.

The Vestibule to the Italian Court is formed on the model of the Casa Taverna of Milan, painted in fresco by Bernardino Luini. He was a pupil of Leonardo da Vinci; and Kugler is of opinion that his merits have not been sufficiently appreciated. Milan is rich in the works of this master. Many of his easel pictures are in the Ambrosian Library, and the Brera; and some of the later works of Da Vinci have been attributed to him—as the half-length figure of the infant Baptist playing with the Lamb, in the Ambrosian Gallery, at Milan, and the picture of Herodias, in the tribune of the Uffizi, at Florence. Kugler, speaking of Luini, says—"It is true he never rises to the greatness and freedom of Leonardo, but he has a never-failing tenderness and purity, a cheerfulness and sincerity, a grace and feeling, which give an elevated pleasure to the spectator in contemplating his pictures. That spell of beauty and nobleness, which so exclusively characterises the more important works of the Raphaellesque period, has here impelled a painter of comparatively inferior talent to works which may often rank with the highest which we know." After referring to some of the paintings of Da Vinci, which have been erroneously attributed to Luini, the same critic proceeds thus:—"The difference between his hand and that of the great master, is seen in the immeasurable inferiority of his execution, especially in his modelling, and also in a greater universality of expression, which, compared with Leonardo's type, displays a close study of the Raphaellesque ideal. Luini's colouring is fresh, even in his frescoes; while, on the other hand, he does not seem to have understood the secret of harmonious composition." The Monastero Maggiore contains numerous works by Luini, of which Kugler makes honourable mention. "Here," says he, "we have the most beautiful figures of female saints, admirable heads of Christ, and lovely infant angels. From the dado, painted in brown chiaro-oscuro, to the roof the walls are covered with masterly frescoes, and the spectator can scarcely gaze his fill in this lavish display of fancy. On the wall, above the entrance to the choir, is a large composition, representing the Crucifixion, containing about one hundred and forty figures; among which a group around the fainting figure of the Virgin, the fine form of the Centurion, those of the soldiers dividing the garments, and the Magdalen kneeling in ecstasy, are particularly remarkable. The painter, however, has attained the highest perfection in his figure of St. John, whose action and expression are full of the loftiest inspiration and faith." The painting in our National Gallery, of "Christ disputing with the Doctors," attributed to Leonardo da Vinci, is believed to be a production of Luini's.

The ceiling above the gallery in the Italian Court is by the famous Bolognese artist, Sebastiano Serlio. It is taken from the

Biblioteca Antica of Venice, constructed by Sansovino. Serlio was a pupil of Baldassare Peruzzi, who made a profound and extensive study of the antiquities of Rome, but more particularly of those relating to architecture. It was from the researches of Baldassare that Serlio obtained most of his materials for the third book of the *Architecture*, and for the fourth book of the *Antiquities of Rome*, with their admeasurements. In these works the results of Baldassare's studies were inserted in the margin. Serlio was employed by Francis I. at Fontainebleau and the Louvre, and died at the former place in 1568.

Among the various schools of Italy which flourished during the third period of the Renaissance epoch, that of Venice was remarkable for its excellence of colour in painting. "It was chiefly this quality," says Kugler, "which gives the stamp of perfection to their productions; with admirable mastery they give the warmth of life to the colour of the flesh, imitate the splendour and brilliancy of different materials, and, if we may venture to say so, relieve light on light; but this technical skill is in them the expression of a characteristic and elevated conception; it is the enjoyment of life and of its splendour, which speaks in all the nobler productions of this school. And although this general theme would appear to restrict imitation to familiar objects and circumstances, yet they knew how to penetrate life in all its aspects and all its depths; and, on the other hand, to treat the grandest themes. For the rest, it is to be remarked, that the Venetians, on the whole, painted very little in fresco, but chiefly in oil, in which method they executed pictures of the largest dimensions. The reason is evident; as the nature of oil-painting is much more favourable to their peculiar object than the severer method of fresco."

Sir Charles Eastlake, who edited the English translation of Kugler, referring to the expression "relieve light on light," says, "It is no hyperbole; it describes, in point of fact, the mode of laying on the colours peculiar to the masters of the Venetian school, which was the result of a close observation of the effect of colour and light upon the eye itself." Sir Charles then quotes an elaborate criticism from Von Quandt's translation of Lanzi's *History of Painting in Italy*, which we transfer to our pages, on account of its very minute and discriminating character:—"Every part of a healthy form, on which the light of the sun directly falls, is of that glowing, reddish, yellowish colour which most delights the eye, and which it most eagerly seeks in a picture. Thus it is that the portions thus lighted, and thus coloured, are also the most conspicuous. Other parts, which, lying obliquely, do not receive the rays of the sun upon them, are lighted by the reflection from other objects at a greater or less distance from them, or by the light with which the atmosphere is pervaded. These reflections cast upon the object on which they fall something of the colour of the objects from which they are derived. Being therefore of a bluish tint when derived merely from the open air, they impart this same bluish tint to the object they light; and when this happens to be the tender surface of the human body, itself of a reddish colour, a light greyish green tint results. This colour, being duller, is less conspicuous to the eye, and thus the portions so lighted recede apparently from sight, and take the effect of half-shadows, though really almost as light as the lightest parts."

Among the great masters of the Venetian school who adopted this style of colouring was Giorgio Barbarelli of Castel Franco, generally called Giorgione, on account of the loftiness of his stature. He was a pupil of Giovanni Bellini, who first introduced oil-painting into Venice; but his style was constrained, and wanted that freedom of handling in which Giorgione excelled. Giorgione was born in 1478, and died in 1511. He imitated and almost equalled the style of Leonardo da Vinci, remarkable for its softness where objects were thrown into powerful relief by the extreme darkness of the shadows. His colouring was distinguished for its freshness and animation; and his countenances had the appearance of reality rather than of art. It is narrated of this master that he undertook to execute a single figure in painting in such a manner as to show the front, back, and profiles of both sides at one and the same time, which apparently impossible task he executed in the following manner:—He painted a nude figure, with its back turned to the spectator; at the feet of the figure was a limpid stream, whereon the reflection of the front was painted with the utmost exactitude; on one side was a highly-burnished corslet, of which the figure had divested itself, and wherein the left side was reflected perfectly, every part being clearly apparent; on the other side was a mirror,

on which the right profile of the nude form was also exhibited. The object of Giorgione was to show that painting is capable of presenting more at one view than is practicable in sculpture. He died at the early age of thirty-three; had his life been extended, the best critics are of opinion that he might have disputed the palm of excellence even with Titian. Among his works, his masterpiece is considered to be the picture in which St. Mark, St. Nicholas, and St. George, embark in a small boat to encounter a ship filled with demons, who threaten the destruction of Venice. Among his best imitators was Sebastian del Piombo, famous for his portraits.

The brightest ornament of the Venetian school was Titian, of the Vecelli family. He was born at Cadore, on the borders of Friuli, in the year 1477, and died of the plague in 1576, being then in the ninety-ninth year of his age. He was the inventor of brilliancy and lightness of hue; and is the earliest artist who gave real character to landscape. His backgrounds were remarkable for their superior beauty. He studied under John Bellini in his youth, as Giorgione had done, and copied the free style of the latter, instead of the harder productions of his master. Among his earlier works are the "Bacchus," and "Ariadne," now in our National Gallery.

Titian was the favourite artist of Charles V. of Spain, whose portrait he painted several times, as well as that of his son Philip. The greatest personages deemed it an honour to be portrayed by this remarkable man—as Francis I., of France, Alfonso Sforza, Duke of Milan, the great generals, Marquis l'escara and Antonio de Leyra. At a matured period of his life, Titian changed his style in large works intended to be seen at a distance. His earliest efforts were finished with scrupulous care and delicacy, so that they were equally effective whether the eye of the spectator was close to them or removed; but his later productions, on a large scale, were executed with bold strokes and dashes. "This mode of his," says Vasari, "imitated by artists who have thought to show proof of facility, has given occasion to many wretched pictures, which probably comes from the fact, that whereas many believe the

works of Titian, done in the manner above described, to have been executed without labour, that is not the truth, and those persons have been deceived; indeed it is well known that Titian went over them many times—nay, so frequently, that the labour bestowed on them is most obvious. And this method of proceeding is a judicious, beautiful, and admirable one, since it causes the paintings so treated to appear living, they being executed with profound art, while that art is nevertheless concealed." Among this class of paintings, executed by the command of Queen Maria of Spain, were—Prometheus bound, with the Vulture gnawing his Liver, and Sisyphus rolling the Stone in Hell; Venus abandoned by Adonis; Andromeda chained to the Rock, with Perseus delivering her from the marine Monster; Diana bathing with her Nymphs, and turning Actæon into a Stag; Europa carried across the Bosphorus by Jupiter Tauriform: all these, ordered by the royal family of Spain, were so painted as to be seen from a distance. In the nude female form the colouring of Titian is magical. Kugler institutes an interesting comparison between this artist and Correggio. "Correggio," he says, "seeks animation and excitement; Titian reposes in quiet dignity. Correggio appears to

call his figures into life only to make them the organs of particular emotions; Titian gives them, first and foremost, the grandeur of mere conscious existence. Correggio, in the warmth of his passion, has hardly patience to proceed to the development of fine forms, and therefore carries with him a modern air; Titian always builds on the unmovable foundations of necessary and general beauty. Finally, Correggio's chiaro-oscuro is something conditional and accidental—a phenomenon on the surface of objects; Titian's colouring is the expression of life itself." Titian had few scholars, but many imitators. Some critics consider that his genius influenced the school of the Caracci, and determined the landscape style of Poussin and Claude Lorraine. As a portrait-painter he has never been surpassed—perhaps never equalled.

Paris Bordone was another of the Venetian celebrities. For a short time he was a pupil of Titian, but that master took little pleasure in teaching. Bordone, therefore, sought rather to imitate the style of Giorgione, many of whose works he copied. In the Loggia of the Piazza, at Vicenza, Paris executed the "Story of Noah and his Sons," near to the spot where Titian had painted "The Judgment of Solomon;" both of these works have perished,

but the critics of the period declared that they were of equal merit. Venice was his established home, and in that city his chief works were produced, one of the most admired being, the "Fisherman presenting St. Mark's ring to the Signoria of Venice." Bordone visited France in 1538, and there painted many of the ladies of the court of Francis I. For the King of Poland, he executed a picture of "Jupiter" and a "Nymph." At Augsburg, he decorated the Fugger Palace; and, at Milan, contributed a beautiful picture to the Church of San Celso. One of his most exquisite pictures was a sleeping Venus and Cupid, guarded by a servant, which was ordered by the Duchess of Savoy. This artist led a simple and upright life, and was much admired by his contemporaries. His colouring was delicate and rosy, but Kugler thinks that it sometimes borders on effeminacy.

To the Venetian school belongs Jacopo Robusti, better known by the name of Tintoretto—"the little dyer," so called from his father's trade, which was that of a dyer. He was a pupil of Titian's, but continued with him only for a short period. According to some accounts, he was dismissed for inattention or disobedience; others assert that the preceptor was jealous of his pupil. Tintoretto aimed high in his art; and, as a proof that he had formed an exalted opinion of his own abilities, he posted on the wall of his workshop, "The design of Michael Angelo, and the colouring of Titian." The great fault of Tintoretto was rapidity of execution, in which he prided himself, not considering that patient labour is the price that must be paid for all excellence; the consequence is, that while parts of his works are admirable, few are perfect in the whole of artistic arrangement.

Paolo Cagliari, born at Verona, and therefore called Paul Veronese, studied and painted at Venice, and is classed with that school. His "Marriage at Cana, in Galilee," now in the Louvre, is his masterpiece. It is thirty feet wide by twenty feet high. It contains one hundred and twenty figures; the guests are supposed to be almost entirely contemporary portraits: Among the musicians



PIETA, BY BERNINI.





are Paolo Veronese himself playing the violincello, Tintoretto a similar instrument, and Titian the contra-bass. For this most magnificent picture, Theodore Ducas says that the artist only received ninety ducats. Paolo Veronese delighted in festive subjects, in which he displayed magnificent halls, gorgeous costume, and the precious metals in cups and vases; Kugler says of him, "Never had the pomp of colour been so exalted, so glorified, as in his works; his paintings are like full concerts of enchanting music."

The two great masters of the school of Parma were Correggio and Parmigiano. The baptismal name of the former was Antonio Allegri; but, as he was born at the town of Correggio, in 1494, when he had established his fame, he dropped his family name, and took that of his birthplace, as was the custom of the age in which he flourished. He died at the early age of forty. This artist excelled in harmony of colours. His style is distinguished by a continually undulating line, sweetly melting into the groundwork of the picture. No painter surpassed him in foreshortening; but what distinguishes his colouring from that of any of his illustrious contemporaries is a mild, central light, which gradually disappears in the surrounding lucid demi-tints, and in the strongly and splendidly reflected shades. Correggio is pre-eminent in what is styled *chiaro-oscuro*, or that peculiar play of light and shade which spreads such an harmonious repose over his works. He has been styled the anatomist of light and shade in endless gradation. He was able "to give the greatest brilliancy without dazzling, the deepest shade without offending the eye by blackness. The relation of colours is observed with the same masterly skill, so that each appears in itself subdued, yet powerful in relation to others." His frescoes adorned the cupolas of the Cathedral of Parma, and the Church of San Giovanni, in that city. He executed many easel pictures, of which the most beautiful, and which he frequently repeated, is the "Marriage of St. Catherine."

Francesco Mazzuoli, called Parmigiano, from his birthplace, at Parma, was born in 1503, and died in 1540. His taste was formed from a study of the productions of Correggio. That great master taught him the blandishments of colour, and the magic of *chiaro-oscuro*; afterwards, he went to Mantua and Rome, to contemplate the style of Giulio Romano and Raffaello. His peculiar excellence is grace. One of his best works is "Moses breaking the Tables," of which it has been said that the spirit of Raffaello transmigrated into Parmigiano. Adam and the Sybils form part of the same composition, and are only, if at all, inferior to the figure of Moses. Unfortunately for this artist, avarice prompted him to

study alchemy, and what he acquired by painting he lost in the imaginary pursuit of gold. He constructed a laboratory, the heat and gases of which ruined his constitution. A curious anecdote is related of his complete abstraction when painting. During the siege of Rome, in 1527, he was pursuing his labours, when a party of soldiers, intent on pillage, entered his studio, but they were so awed into admiration and respect that they retired without doing him any injury.

The school of Ferrara did not abound in artists, but it produced two of high merit. These were the brothers Dosso Dossi, and Giovanni Batista Dossi, so called from a village named Dosso, near Ferrara, where they were born. In landscapes, Giovanni Batista

was scarcely inferior to Titian. The two brothers were employed by Ariosto to paint his portrait, and illustrate the *Orlando Furioso*. The best works of Dosso Dossi were "St. John at Patmos," in the Church of Lateranensi, at Ferrara; and his "Christ among the Doctors," which he intended to have placed in a church at Faenza. Ducas says of him, "He could paint Holy Families with the grace of Raffaello, the colouring of Titian, and the *chiaro-oscuro* of Correggio. He retains more of the antique than those masters; but his composition, his draperies, and his various and harmonious colouring are his own." In the judgment of Kugler, their works display a Venetian influence in the style of Giorgione, as well as the fundamental style of the Ferrara school.

Art reached perfection in the time of Raffaello and Michael Angelo, though the latter lived long enough to witness its decline. Artists committed the mistake of fancying that highly-finished productions could be executed without labour, and they vied with each other in covering large surfaces of canvas with rapidity. "They paint," says Vasari, "six pictures in a year, while the earlier masters took six years to one picture." With this hastiness, a corrupt taste was gradually introduced. "No one remembered," Kugler remarks, "that the foundation of all artistic greatness depended on the mysterious harmony between

the personality of the painter and his subject. The external signs of the great masters, their effect and manner, were the objects of imitation; first with due modesty, and then with gradually increasing boldness, till they led to the grossest exaggerations. That which was overlooked was certainly that which was least susceptible of imitation, viz., the deep poetic intention, the noble and harmonious conception, and that arrangement which was dictated by the highest laws. Many of the painters in question would, fifty years earlier, have done great things; now they fell into repulsive mannerism, because no longer supported by those principles of harmony and beauty which, at the beginning of the



MOSES BREAKING THE TABLES, BY PARMIGIANO.

sixteenth century, had inspired even mediocre talent to truly great works. Where immediate truth of nature was required,—as, for instance, in portraits,—great excellence was, however, displayed.”

After the Mannerists came the Eclectic schools, which were followed by the Naturalisti. The chief of the Eclectic schools was founded by the Carracci, at Bologna, Ludovico, and his two nephews, Agostino and Annibale Carracci. They proposed to themselves the study of nature and the imitation of the great masters. Agostino embodied the principles of his academy in a sonnet, which may be thus translated:—“Let him who wishes to be a good painter acquire the design of Rome, Venetian action and Venetian management of shade, the dignified colouring of Lombardy (that is, of Leonardo da Vinci), the terrible manner of Michael Angelo, Titian’s truth and nature, the sovereign purity of Correggio’s style, and the

just symmetry of Raffaello, the decorum and well-grounded study of Tibaldi, the invention of the learned Primaticcio, and a little of Parmigiano’s grace; but without so much study and weary labour, let him apply himself to imitate the works which our Niccolo (dell’ Abbate) left us here.” Among the most eminent pupils of the Carracci school were Domenichino, Albani, and Guido.

The Naturalisti prided themselves on their direct imitation of nature. The chief master of this school was Caravaggio, and his most eminent pupil was Giuseppe Ribera, a Spaniard by birth, and generally known by the name of Spagnoletto. He also founded a school, and was the teacher of the famous Salvator Rosa. It is foreign to our plan to offer any criticism on these later artists, who have not contributed anything to the Italian Court; but, in a work of this description, their existence ought to be recognised.

THE POMPEIAN COURT.

THE Pompeian is the least attractive of the Fine-Art Courts within the Crystal Palace. There is an air of nakedness about it, scarcely relieved by the few paintings on the walls, so that it barely admits of pictorial illustration; and, as the story of Pompeii has been frequently narrated, both by English and continental writers, and all the documents recording its melancholy fate been diligently sifted, we do not pretend to infuse much novelty into these pages.

That district of Italy which contains the buried cities of Herculaneum and Pompeii was comprised between the mountains of Samnium and the Tyrrhenian Sea. The most distinguishing geographical feature was the Gulf of Cumæ, included between Cape Misenum and the promontory of Minerva, and called from its shape Crater, or the Cup. It is now known as the Bay of Naples, at the bottom of which stood Pompeii, thirteen miles from Naples, and five from Vesuvius. From the marks of igneous action on the shores, the ground skirting them was called, *Campi Phlegrei*, or Burnt Fields, though we have no record of an eruption of Vesuvius prior to that which occurred on the 16th of February, A.D. 63, throwing down a considerable part of Pompeii, and materially injuring Herculaneum. But the visible action of fire is very strong, if not conclusive, evidence that volcanic agency must have visited the districts at some remote period, of which no tradition remains. Ancient fable attempts to account for these appearances, by describing the *Campi Phlegrei* as the scene of the battle between the gods and the giants, when the latter were destroyed by the thunderbolts of Jupiter: then the earth was scorched by fire. Here also was Lake Avernus, the opening to the infernal regions, whose mephitic exhalations proved fatal to every bird flying over its waters. This portion of Campania, however, had its beauties as well as its terrors; and if Homer has thrown an awful horror over the whole coast, Virgil has painted it as the locality of the Elysian Fields. Poetry, indeed, has embellished the whole region with enchanting fictions. It is also immortalised as the favourite residence of the most illustrious of the Romans. Marius had a villa on the height of Misenum, of which Lucullus afterwards became the proprietor. Here Cicero and Hortensius, rival orators, held philosophic intercourse; and Cæsar and Pompey, when suspending their struggles for the mastery of the world, sought relaxation on those delightful shores. Baiæ was frequented by Augustus, and his great ministers, Mæcenas and Agrippa; and there the emperor, free from the cares of state, received Virgil and Horace as his guests.

Prior to the two eruptions of A.D. 63 and A.D. 79, Vesuvius presented a very different aspect from that which we now behold. After describing the surrounding territory, Strabo says—“Above these places rises Vesuvius, well-cultivated, and inhabited all round, except its top, which is for the most part level, and entirely barren, ashy to the view, displaying cavernous hollows in cineritic rocks, which look as if they had been eaten in the fire, so that we may suppose this spot to have been a volcano formerly, with burning craters, now extinguished for want of fuel.” The summit is no longer level, but conical, the cone standing within a circular volcanic ridge. “A volcano, properly so called, exists only where a permanent connection is established between the interior of the earth and the atmosphere, and the reacting of the interior on the surface

then continues during long periods of time. It may be interrupted for centuries, as in the case of Vesuvius (Fisove), and then manifest itself with renewed activity. In the time of Nero, men were disposed to rank Etna among the volcanic mountains which were gradually becoming extinct; and, subsequently, Ælian even maintained that mariners could no longer see the sinking summit of the mountain from so great a distance at sea. Where these evidences—these old scaffoldings of eruption, I might almost say—still exist, the volcano rises from a crater of elevation, while a high rocky wall surrounds, like an amphitheatre, the isolated conical mount, and forms around it a kind of casing of highly-elevated strata.”* In this manner the present configuration of Vesuvius has been formed; but it may be said to have two summits—the cone, and, separated from it by a deep valley, a ridge called Monte Somma. The distance between these two summits, in a straight line, is nearly 2000 feet; that of Somma is truncated. The valley between them is filled with calined stones, cinders, and ashes; hence, as Mr. Eustace remarks, it is conjectured that it is part of the interior of the mountain, as the ridge that borders it, or the Monte Somma, is the remnant of the exterior, or original surface, so much celebrated for its beauty and fertility, before the eruption in A.D. 79.

It was in the reign of the Emperor Titus Vespasian that the eruption took place, accompanied by an earthquake, which overwhelmed Herculaneum, Pompeii, and Stabian. Dion Cassius, who wrote more than a century after the catastrophe, states that the burning ashes were carried to Africa, Syria, and Egypt, filling the air above Rome, and shadowing the sun. From that time eruptions appear to have been intermittent. They are recorded in the fifth and sixth centuries. Procopius, in his history of the Gothic War, describes the mountain as emitting rivers of fire, and projecting ashes to Africa and Byzantium. This was the result of the compound action of an earthquake and a volcano. “The activity of an igneous mountain, however terrific and picturesque the spectacle may be which it presents to our contemplation, is always limited to a very small space. It is far otherwise with earthquakes, which, although scarcely perceptible to the eye, nevertheless simultaneously propagate their waves to a distance of many thousand miles. The great earthquake which destroyed the city of Lisbon, on the 1st of November, 1755, and whose effects were so admirably investigated by the distinguished philosopher Emanuel Kant, was felt in the Alps, on the coast of Sweden, in the Antilles, Antigua, Barbadoes, and Martinique; in the great Canadian lakes, in Thuringia, in the flat country of Northern Germany, and in the small inland lakes on the shores of the Baltic. Remote springs were interrupted at their flow—a phenomenon attending earthquakes which had been noticed amongst the ancients by Demetrius, the Callatian. The hot springs of Toplitz dried up, and returned, inundating everything around, and having their waters coloured with iron ochre. In Cadiz, the sea rose to an elevation of sixty-four feet; whilst in the Antilles, where the tide usually rises only from twenty-six to twenty-eight inches, it suddenly rose above twenty feet, the water being of an inky blackness. It has been computed that, on the 1st of November, 1755, a portion of the earth’s surface, four times greater than

* Humboldt’s *Cosmos*, vol. i. p. 224. Bohn’s Edition.

that of Europe, was simultaneously shaken."* Dr. Daubeny considers that the Cadiz earthquake pervaded an area of 700,000 miles, or the twelfth part of the circumference of the globe. The dreadful shock lasted only five minutes. A large part of the population were in the churches, for it was the feast of All Saints; and 30,000 perished by the fall of those edifices. We may, therefore, easily credit the statements of Dion and Procopius.

The eruption of Vesuvius, A.D. 79, is minutely recorded by an eye-witness, in all respects qualified to hand down to posterity a vivid and faithful narrative of that solemn event. This highly-interesting narrative is contained in two letters of Pliny the Younger to Tacitus; and to condense so precious a memorial of antiquity would be worse than mutilation. The first letter relates to the death of Pliny's uncle, the writer on natural history.

"Your request that I would send you an account of my uncle's death, in order to transmit a more exact relation of it to posterity, deserves my acknowledgments; for, if this accident shall be celebrated by your pen, the glory of it, I am well assured, will be rendered for ever illustrious. And notwithstanding he perished by a misfortune, which, as it involved at the same time a most beautiful country in ruins, and destroyed so many populous cities, seems to promise him an everlasting remembrance; notwithstanding he has himself composed many and lasting works; yet I am persuaded the mentioning of him in your immortal works will greatly contribute to eternise his name. Happy I esteem those to be whom Providence has distinguished with the abilities either of doing such actions as are worthy of being related, or of relating them in a manner worthy of being read; but doubly happy are they who are blessed with both these uncommon talents; in the number of which my uncle, as his own writings and your history will evidently prove, may justly be ranked. It is with extreme willingness, therefore, I execute your commands; and should, indeed, have claimed the task, if you had not enjoined it. He was at that time, with the fleet under his command, at Misenum. On the 24th of August, about one in the afternoon, my mother desired him to observe a cloud, which appeared of a very unusual size and shape. He had just returned from taking the benefit of the sun, and, after bathing himself in cold water, and taking a slight repast, was retired to his study. He immediately arose, and went out upon an eminence, from whence he might more distinctly view this very uncommon appearance. It was not at that distance discernible from what mountain this cloud issued; but it was found afterwards to ascend from Mount Vesuvius. I cannot give a more exact description of its figure than by resembling it to that of a pine-tree, for it shot up a great height in the form of a trunk, which extended itself at the top into a sort of branches, occasioned, I imagine, either by a sudden gust of air that impelled it, the force of which decreased as it advanced upwards; or the cloud itself, being pressed back again by its own weight, expanded in this manner; it appeared sometimes bright, and sometimes dark and spotted, as it was more or less impregnated with earth and cinders. This extraordinary phenomenon excited my uncle's philosophical curiosity to take a nearer view of it. He ordered a light vessel to be got ready, and gave me the liberty, if I thought proper, to attend him. I rather chose to continue my studies, for, as it happened, he had given me an employment of that kind. As he was coming out of the house, he received a note from Rectina, the wife of Bassus, who was in the utmost alarm at the imminent danger which threatened her; for her villa being situated at the foot of Mount Vesuvius, there was no way to escape but by sea: she earnestly entreated him, therefore, to come to her assistance. He accordingly changed his first design; and what he began with a philosophical, he pursued with an heroic turn of mind. He ordered the galleys to put to sea, and went himself on board, with an intention of assisting not only Rectina, but several others; for the villas stand extremely thick upon that beautiful coast. When hastening to the place from whence others fled with the utmost terror, he steered his direct course to the point of danger, and with so much calmness and presence of mind, as to be able to make and dictate his observations upon the motion and figure of that dreadful scene. He was now so nigh the mountain that the cinders, which grew thicker and hotter the nearer he approached, fell into the ships, together with pumicestones, and black pieces of burning rock: they

were likewise in danger, not only of being aground by the sudden retreat of the sea, but also from the vast fragments which rolled down from the mountain, and obstructed all the shore. Here he stopped to consider whether he should return back again, to which the pilot advising him—"Fortune," said he, "befriends the brave; carry me to Pomponianus." Pomponianus was then at Stabiae, separated by a gulf which the sea, after several insensible windings, forms upon the shore. He had already sent his baggage on board; for though he was not at that time in actual danger, yet being within the view of it, and, indeed, extremely near, if it should in the least increase, he was determined to put to sea as soon as the wind should change. It was favourable, however, for carrying my uncle to Pomponianus, whom he found in the greatest consternation. He embraced him with tenderness, encouraging and exhorting him to keep up his spirits, and the more to dissipate his fears, he ordered, with an air of unconcern, the baths to be got ready; when, after having bathed, he sat down to supper with great cheerfulness, or at least (what is equally heroic) with all the appearance of it. In the meanwhile, the eruption from Mount Vesuvius flamed out in several places with much violence, which the darkness of the night contributed to render still more visible and dreadful. But my uncle, in order to soothe the apprehensions of his friend, assured him it was only the burning of the villages, which the country people had abandoned to the flames. After this he retired to rest, and it is most certain he was so little discomposed as to fall into a deep sleep; for being pretty fat, and breathing hard, those who attended without actually heard him snore. The court which led to his apartment being now almost filled with stones and ashes, if he had continued there any time longer, it would have been impossible for him to have made his way out: it was thought proper, therefore, to awaken him. He got up, and went to Pomponianus and the rest of his company, who were not unconcerned enough to think of going to bed. They consulted together whether it would be most prudent to trust to the houses, which now shook from side to side with frequent and violent concussions, or fly to the open fields, where the calcined stones and cinders, though light indeed, yet fell in large showers, and threatened destruction. In this distress, they resolved for the fields, as the less dangerous of the two—a resolution which, while the rest of the company were hurried into by their fears, my uncle embraced upon cool and deliberate consideration. They went out then, having pillows tied upon their heads with napkins; and this was their whole defence against the storm of stones that fell around them. It was now day everywhere else, but there a deeper darkness prevailed than in the most obscure night, which, however, was in some degree dissipated by torches and other lights of various kinds. They thought proper to go down farther upon the shore, to observe if they might safely put out to sea; but they found the waves still run extremely high and boisterous. There my uncle, having drunk a draught or two of cold water, threw himself down upon a cloth which was spread for him, when immediately the flames, and a strong smell of sulphur, which was the forerunner of them, dispersed the rest of the company, and obliged him to rise. He raised himself up with the assistance of two of his servants, and instantly fell down dead, suffocated, as I conjecture, by some gross and noxious vapour, having always had weak lungs, and being frequently subject to a difficulty of breathing. As soon as it was light again, which was not till the third day after this melancholy accident, his body was found entire, and without any marks of violence upon it, exactly in the same posture that he fell, and looking more like a man asleep than dead. During all this time my mother and I, who were at Misenum—But as this has no connection with your history, so your inquiry went no farther than concerning my uncle's death, with that, therefore, I will put an end to my letter. Suffer me only to add, that I have faithfully related to you what I was either an eye-witness of myself, or received immediately after the accident happened, and before there was time to vary the truth. You will choose out of this narrative such circumstances as shall be most suitable to your purpose; for there is a great difference between what is proper for a letter and a history, between writing to a friend and writing to the public. Farewell!"

The second letter describes the position and feelings of the writer himself during the catastrophe.

"The letter which, in compliance with your request, I wrote to you concerning the death of my uncle, has raised, it seems, your

* Humboldt's Cosmos, vol. i. p. 206. Bohn's Edition.

curiosity to know what terrors and dangers attended me while I continued at Misenum; for there, I think, the account in my former broke off.

" 'Though my shocked soul recoils, my tongue shall tell.'

My uncle having left us, I pursued the studies which prevented my going with him till it was time to bathe. After which I went to supper, and from thence to bed, where my sleep was greatly broken and disturbed. There had been, for many days before, some shocks of an earthquake, which the less surprised us, as they are extremely frequent in Campania; but they were so particularly violent that night, that they not only shook everything about us, but seemed, indeed, to threaten total destruction. My mother flew to my chamber, where she found me rising, in order to awaken her. We went out into a small court belonging to the house, which separated the sea from the buildings. As I was at that time but eighteen years of age, I know not whether I should call my behaviour, in this dangerous juncture, courage or rashness; but I took up Livy, and amused myself with turning over that author,

even by supporting them with large stones. The sea seemed to roll back upon itself, and to be driven from its banks by the convulsive motion of the earth. It is certain, at least, the shore was considerably enlarged; and several sea animals were left upon it. On the other side, a black and dreadful cloud, bursting with an igneous serpentine vapour, darted out a long train of fire, resembling flashes of lightning, but much larger. Upon this our Spanish friend, whom I mentioned above, addressing himself to my mother and me with great warmth and earnestness, 'If your brother and your uncle,' said he, 'is safe, he certainly wishes you may be so too; but if he perished, it was his desire, no doubt, that you might both survive him; why, therefore, do you delay your escape a moment?' We could never think of our own safety, we said, while we were uncertain of his. Hereupon our friend left us, and withdrew from the danger with the utmost precipitation. Soon afterwards the cloud seemed to descend, and cover the whole ocean; as indeed it entirely hid the island of Caprea and the promontory of Misenum. My mother strongly conjured me to make my escape at any rate,



INTERIOR OF THE POMPEIAN COURT.

and even making extracts from him, as if all about me had been in full security. While we were in this posture, a friend of my uncle's, who was just come from Spain to pay him a visit, joined us; and observing me sitting by my mother with a book in my hand, greatly condemned her calmness, at the same time that he reproved me for my careless security. Nevertheless, I still went on with my author. Though it was now morning, the light was exceedingly faint and languid; the buildings all around us tottered, and, though we stood upon open ground, yet, as the place was narrow and confined, there was no remaining there without certain and great danger: we therefore resolved to quit the town. The people followed us in the utmost consternation, and, as to a mind distracted with terror every suggestion seems more prudent than its own, pressed in great crowds about us in our way out. Being got at a convenient distance from the houses, we stood still, in the midst of a most dangerous and dreadful scene. The chariots which we had ordered to be drawn out were so agitated backwards and forwards, though upon the most level ground, that we could not keep them steady,

which, as I was young, I might easily do; as for herself, she said, her age and corpulency rendered all attempts of that sort impossible. However, she would willingly meet death, if she could have the satisfaction of seeing that she was not the occasion of mine. But I absolutely refused to leave her; and taking her by the hand, I led her on. She complied with great reluctance, and not without many reproaches to herself for retarding my flight. The ashes now began to fall upon us, though in no great quantity. I turned my head, and observed behind us a thick smoke, which came rolling after us like a torrent. I proposed, while we had yet any light, to turn out of the high road, lest she should be pressed to death in the dark by the crowd that followed us. We had scarce stepped out of the path when darkness overspread us, not like that of a cloudy night, or when there is no moon, but of a room when it is shut up, and all the lights extinct. Nothing then was to be heard but the shrieks of women, the screams of children, and the cries of men; some calling for their children, others for their parents, others for their husbands, and only distinguishing each other by their voices; one

lamenting his own fate, another that of his family; some wishing to die from the very fear of dying; some lifting their hands to the gods; but the greater part imagining that the last and eternal night was come, which was to destroy the gods and the world together. Among these were some who augmented the real terrors by imaginary ones, and made the frightened multitude falsely believe that Misenum was actually in flames. At length a glimmering light appeared, which we imagined to be rather the forerunner of an approaching burst of flames, as in truth it was, than the return of day. However, the fire fell at a distance from us; then again we were immersed in thick darkness, and a heavy shower of ashes rained upon us, which we were obliged every now and then to shake off, otherwise we should have been crushed and buried in the heap. I might boast that, during all this scene of horror, not a sigh or expression of fear escaped from me, had not my support been founded in that miserable, though strong consolation, that all mankind were involved in the same calamity, and that I imagined I was perishing with the world itself! At last this dreadful dark-

The ashes from volcanoes, which sometimes darken the air for hours and days together, and produce great injury to the vineyards and the olive groves, by adhering to the leaves, indicate by their columnar ascent, impelled by vapours, the termination of every great earthquake. This, says Humboldt, is the magnificent phenomenon which Pliny the Younger, in his celebrated letter to Cornelius Tacitus, compares, in the case of Vesuvius, to the form of a lofty and thickly-branched foliaceous pine.

This eruption did not throw out lava, but mud, cinders, scorine, and sand; and the effect on Herculaneum was very different from that produced on Pompeii. On the former city fell a torrent of mud, accompanied by steam, which, on cooling, hardened and formed a solid crust. According to Dr. Daubeny, "true volcanoes generate sulphuretted hydrogen and muriatic acid, upheave tracts of land, and emit streams of melted feldspathic materials; salses, on the contrary, disengage little else but carburetted hydrogen, together with bitumen, and other products of the distillation of coal, and pour forth no other torrents except of mud, or argillaceous



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ness was dissipated by degrees, like a cloud of smoke; the real day returned, and even the sun appeared, though very faintly, and as when an eclipse is coming on. Every object that presented itself to our eyes (which were extremely weakened) seemed changed, being covered over with white ashes, as with a deep snow. We returned to Misenum, where we refreshed ourselves as well as we could, and passed an anxious night between hope and fear—though, indeed, with a much larger share of the latter; for the earthquake still continued, while several enthusiastic people ran up and down, heightening their own and their friends' calamities by terrible predictions. However, my mother and I, notwithstanding the danger we had passed, and that which still threatened us, had no thoughts of leaving the place till we should receive some account from my uncle.

"And now you will read this narrative without any view of inserting it in your history, of which it is by no means worthy; and indeed you must impute it to your own request if it shall deserve the trouble of a letter. Farewell!"

materials mixed up with water. Herculaneum being immediately under Vesuvius, felt the shock of the salses, or mud volcano, which appears to have been spent before the explosion reached Pompeii, the latter city being buried under a covering of merely unconsolidated ashes."

The first stream of lava of which we have any authentic account broke out in the year 1036. Several followed, at longer or shorter dates; but those of 1776 and 1777 are the most remarkable, and have been minutely described by Sir William Hamilton, in his magnificent work, the *Campi Phlegrei*. During his observations of the explosions, he states that a fountain of fire burst forth to three times the height of Vesuvius, which, according to the measurement of Humboldt, rises 3874 feet above the level of the sea. The latest eruption of any importance took place in 1822.

After the engulfing of the Campanian cities, Neapolis, the modern Naples, arose to undisputed pre-eminence; and Portici and Resina were built on the lava of Herculaneum, the buried city being seventy feet below the surface. History had too faithfully

preserved the fact of the Vesuvian eruption, and of its destructive consequences, to allow the catastrophe to escape the speculations of antiquarians; and the result of some excavations, in the year 1689, had been communicated to the French Academy of the Sciences. In 1706, the Prince D'Elbeuf, descended from the famous Guises of the house of Lorraine, who played so memorable a part in the religious wars of France, visited Naples, and, in 1711, built a marine villa at Portici for his own residence. During his sojourn there, a peasant, sinking a well in his garden, at Resina, found several fragments of marble, which excited the curiosity of the prince, who purchased the ground, and, commencing a series of excavations, soon discovered various statues, pillars, and even a whole temple of the finest marble, adorned with statues. The Neapolitan government, prompted by jealousy or ignorance, then interfered, compelling the prince to desist from his interesting labours; and further explorations were suspended for nearly thirty years. The government became purchasers of the site round which the well had been sunk, on which the king of Naples built a palace, thus rendering future explorations more difficult. It is said that the Prince D'Elbeuf had in his service a Frenchman, who possessed the art of making a durable stucco out of pulverised marble, for which purpose the buried marble was sought after; but it is most probable that he merely imitated the process invented by Giovanni da Udine, which we have explained in our account of the Italian Court.

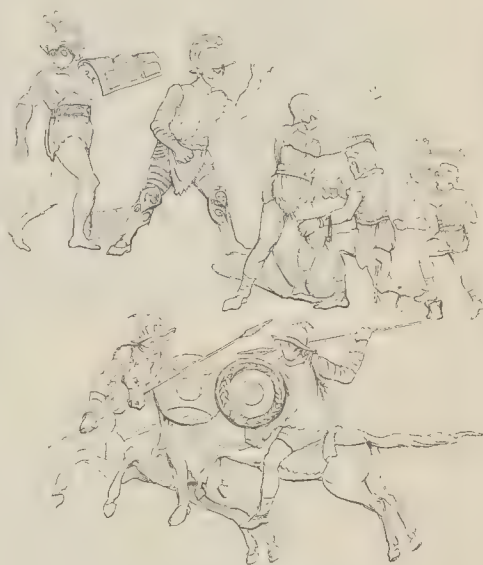
It was in 1736 that King Charles III. of Naples built the palace at Portici. Excavations were renewed near the now famous well, and fresh treasures were discovered, satisfying scientific men that the subject of their researches was Herculaneum. A buried theatre was unearthed; the seats and steps were distinctly marked. A fine basilica next rewarded an industrious curiosity, containing the equestrian statues of the Balbi, and the famous pictures of Hercules and Telephus, Theseus and the Minotaur; bronze statues of Nero and Germanicus, and one of Vespasian, nine feet high. Unfortunately no systematic plan of working was adopted, by which the entire city might have been thrown open, and continuously examined; on the contrary, too many were actuated by a spirit of plunder, more eager to possess themselves of some choice relics than to preserve the whole fabric. Even the marble was torn from the temples, as though the place were sacked by a hostile army; and when as many valuables had been removed as were supposed to be recoverable, the plundered streets were filled up with rubbish. It is, however, to be remembered that Portici and Resina had been built on the site of Herculaneum, as well as the palace, and excavations, injudiciously conducted, might have sapped the foundations of those cities.

The most interesting treasures of Herculaneum were the manuscripts, and the learned hoped for the restoration of the lost Decades of Livy, and other regretted writings of Greece and Rome. The number collected was three hundred and seventy-seven, the great majority being in Greek, and but few in Latin; they chiefly consisted of treatises relating to the philosophy of Epicurus. But the recovery of lost literature was a very minor object with the explorers, eager to collect statues and paintings, bronzes and gems; though it may fairly be presumed, considering the opulence of Herculaneum, and the leisure enjoyed by the higher class of its inhabitants, that more ample libraries would have rewarded a more vigorous research. It should be recorded to the honour of King George IV., that, when Prince of Wales, he undertook the expense of deciphering the manuscripts, and selected for that arduous task the Rev. W. Hayter, a clergyman of the Church of England, who for some years superintended the unfolding of the rolls of papyri—a most delicate operation considering the fragility of the material. While we may regret that so little has been added to our stores of knowledge by these laborious processes, it must be borne in mind that it would probably have exhausted a century or more to have unfolded and deciphered the manuscripts, as they were fast crumbling to dust, and, without a manipulation most careful and most tedious, they would have been destroyed by the mere action of the hand.

The first discoveries at Pompeii were made in the beginning of 1749: a ploughman turned up a statue of brass in a field. Excavations followed, and an apartment was opened decorated with the figures of sixteen dancing females, brightly coloured, two centaurs and figures, bands of arabesques forming panels, with cupids in the midst, and twelve fauns dancing in a row, all on a black ground. One of the most interesting discoveries brought to light

was the long avenue of sepulchral monuments, lining both sides of the highway almost up to the very gates of the city, adorned with columns and pyramids, marble busts and statues. Some of these monuments are square, others are circular. That called *Nevoleja Tiches* is one of the most magnificent, and has been described by Eustace. It consists of a large oblong marble basis, raised two steps above a larger one of the same figure, and said to be of volcanic lava, which is certainly erroneous, since, as already stated, no lava fell on Pompeii so as to encase it even with a coating; and prior to A.D. 79, there had been no eruption of Vesuvius discharging lava; and we can hardly believe that this material would have been imported from Etna or elsewhere. The front, back, lateral sides, and cornice, are decorated with noble ornaments, ending in branches of winding foliages. In the frieze of the upper basis is placed the bust of *Nevoleja*. Underneath the epitaph is a sacrifice represented in basso-relievo, with eighteen personages in two groups. Two boys in the middle place the sacred offering on the altar. On the side facing the door is the *bisellium*, an honorific seat for two persons to sit upon; and on that facing the north is carved in marble a bark with one mast, and a yard hoisted up, on which is bent a square sail. A man, with short cut hair, and a tunic that scarcely reaches to his knees, sits at the helm. Two lads, naked, clinging to the yard, seem to furl the sail, whilst two others are climbing up the stays, and a man with short garments, standing upright, collects the ropes together—an emblem this of human life. The bark, without oars, is ornamented at the stern with the bust of Minerva, and at the prow with that of a goose, its long neck stretched out. The walls of the inclosure are topped with little pyramids. The door which leads into it is low, so also is that which communicates with the *columbarium*. This is a small chamber, about six feet square, in which are two rows of niches, five in the upper, and six in the lower row, close to the ground. In these niches were placed the cinerary urns, and with each of them a lamp of burnt clay.

In the private and public buildings many pictures were found, chiefly descriptive of mythology, and some were very beautiful.



GLADIATORIAL COMBATS.

We have engraved some scenes from the combats of the gladiators. In the equestrian fight both parties are armed and accoutred alike, with lance, round buckler, and vizored helmet. Their arms are protected with mail, and they wear short cloaks. The legs are bare, but one of them has on a shoe, laced up to the lower part of

the calf, and he is levelling his raised lance at his opponent, who is on the defensive. Above these, on the left, is a gladiator on foot, with helmet and buckler, but unarmed; next to him is one wearing the *subligaculum*, or short apron; he wears greaves from the hips to the knees. To the right of these are four other figures. One is wounded in the leg, thigh, and left arm, from which blood is flowing. He is a *secutor*, who has been entangled in the net of the *retiarius*; and the *secutor*, attached to this *retiarius*, has his hand on the head of the wounded man, whom he dispatches with a sword held in his left hand. In the distance is another *retiarius*, distinguishable by his trident, with which he can remove the net from his entangled foe. He is hurrying forward, as he must now fight the conqueror.

We need not enter into lengthened details of the fora, the baths, the theatres, or amphitheatres, as they were modelled on similar buildings at Rome, which have been described in the Roman Court. Several edifices have received particular names, more fanciful than distinctive, and in these some valuable paintings were discovered. One of these has been variously called the House of the Tragic Poet, and the House of the Homeric Paintings. Among the pictures therein found were the Marriage of Peleus and Thetis; the Parting of Achilles and Briseis (see p. 104); the Departure of Chryseis from Agamemnon; the Battle of the Amazons and Greeks; the Fall of Icarus; Venus Anadyomene; the Sacrifice of Iphigenia; Leda and Tyndareus; Theseus and Ariadne. In the *Pompeiana* of Sir William Gell, these pictures have been engraved. Referring to the second in the preceding list, he goes to the extreme length of saying that, "when first discovered, the colours were fresh, and the flesh particularly had the transparency of Titian;" a very remarkable statement, considering that the picture had been buried some seventeen hundred years, for it was not recovered till the year 1824. The House of the Questor, otherwise called the House of the Dioscuri, sons of Jupiter and Leda, was thrown open to view in 1829. It receives its second appellation from statues

of Castor and Pollux found in the vestibule; its first title is very fanciful, the only foundation for it being the discovery of two large chests, which some antiquarian, more ingenious than logical, decided must have contained public monies, they being of beautiful workmanship; but there is no evidence that a questor ever resided at Pompeii. This building contained a painting of Jupiter, seated on his throne, and crowned by Victory; Fortune, holding a rudder; Bacchus with the Thyrsus; Ceres; Apollo and his Lyre; Perseus delivering Andromeda from the Sea Monster; Jupiter and Europa; Diana visiting Endymion; the Quarrel between Agamemnon and Achilles; Minerva interposing to appease the wrath of the latter; Ulysses discovering Achilles, clothed as a woman, at the Court of Lycomedes; and the Return of Ulysses to Ithaca. The House of Sallust was one of the most elegant and spacious that rewarded the researches of the excavators. It has also been called the House of Actæon, on account of a painting representing that famous sportsman torn by his own hounds, and Diana coming from the bath or river in a state of nudity. Here was found a marble pedestal, on which a bronze stag was placed, having on its back a young Hercules of exquisite beauty. The best paintings represented the Rape of Europa, the Fall of Helle into the Pontic Sea, called from her the Hellespont, and Phryxus crossing it on the back of the Arles Chrysocollus. The pavement was formed of the richest and rarest African marbles, while the ceiling was decorated with a picture of Mars and Venus, attended by a Cupid. The House of Queen Caroline was discovered in 1813; it is now called

the House of Adonis. In 1831 the House of Meleager was unearthed, which has received the various appellations of Apollo, Isis, and the Nereids. In 1827 the House of the Female Musician was opened, which is also known as the House of the Triumphant Bacchus. That of Pansa, partly opened in 1811, and fully in 1814, is the most complete, and in it skeletons were found; while that of the Faun, in 1831, is famous for a splendid mosaic, representing Alexander and Darius at the Battle of Issus.

The lovers of literature and genius once fondly hoped that they had recognised the dwelling of Cicero; but the majority of antiquarians have decided to the contrary, though the evidence is strong in its favour. Eustace quotes the following passage from the *Academical Questions*:—"Ego Catuli Cumanam ex hoc loco regionem video; Pompejanum non cerno, neque quidquam interjectum est, quod obstat, sed intendi longius acies non potest. O preclarum prospectum! Puteolos videmus, et familiarem nostrum Asianum fortasse in portico Neptuni ambulantes non videmus." From Baulis, then, argues Eustace, the farthest part of the continent of Baia facing Mount Misenum, he could see on the west the country-seat of Catullus, at Cumæ, and, on the north-east, Pozzuoli. Now, it is evident, in examining the situation of Pompeii, that from this hill, and from nowhere else, he could enjoy such a prospect, and here is to be placed his house. Such is the reasoning of Eustace; we think it right to present it to our readers, but it does not fall within our province to enter at any length on a speculative controversy.

We have given an engraving of the gladiatorial combats; we now

introduce one of the fights between men and beasts. The upper male figure on the left hand is weaponless. His attitude is one of active movement and vigilance, for he belonged to that class whose defence depended on personal agility; and it was his duty to engage the wild beasts in the arena, frequently sluggish, but not to kill them. Above him is a wild boar, not, at first view, in a very fitting position; but it must be remembered that the man would have



TRAINING YOUNG GLADIATORS.

to skip and bound before the beast—now nearing it, now receding, always in apparent, never in real danger. Next to him, to the right, is a bull at full speed, with a javelin passed completely through his body; and still further to the right, a hound fixing on the hind quarters of a boar. Returning to the left, and under portion of this bas-relief, is a man with a spear extended over the back of a bull, round whose body a broad girth is passed. In front of the bull is a panther, with a collar round his neck, to which is attached a cord, fastened to the girth of the bull; in front of the panther is a man, with a lance, in act to strike. This tethering of the animals diminished their powers of attack; and the men appear to belong to the class called *Bestiarii*, who were trained to their duty, and perhaps are here represented as practising some of the lessons of their professions, not intending to slay, but to goad and worry their opponents.

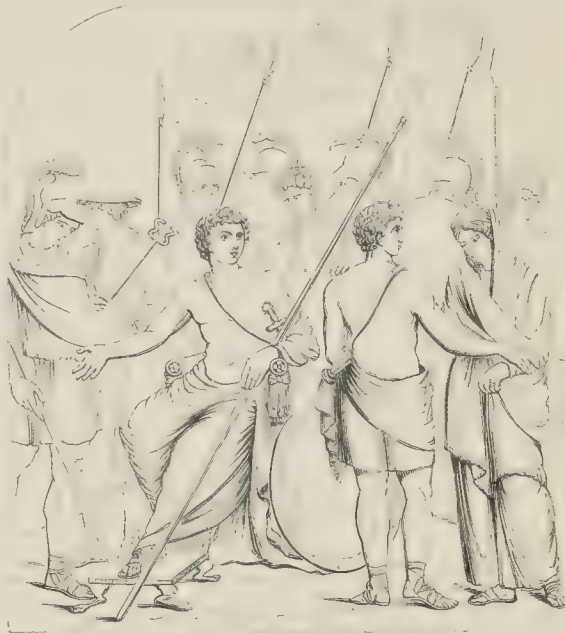
The country residences or villas of the Romans, imitated at Pompeii, were very different in their arrangements from those in modern Europe. In describing them, we will first present a general view taken from Pliny's description of his villa at Laurentum. "My villa," says that writer, "is large enough to afford a convenient though not sumptuous reception for my friends. The part which first presents itself is the *atrium* (court-yard), plain, but not mean; then the *portico*, in form of the letter O, which surrounds a small but pleasant area; this is an excellent retreat in bad weather, being sheltered by glazed windows (*lapis specularis*), but more by the projection of the roof. Beyond the portico is a pleasant *cave-*

dium (open court), passing which is a handsome *triclinium* (dining-room), which advances upon the shore, so that it is gently washed by the waves when the south-west wind blows. On every side are folding doors, or windows, as large, so that from the sides and the front you enjoy a prospect, as it were, of three seas, and backwards are seen the *cavadium*, the portico, and the area; again, the portico and atrium are terminated by woods and distant mountains. On the left of the *triclinium*, but not so forward, is a large *cubiculum* (chamber, or apartment), and then a smaller one, where one window admits the rising, and the other the setting, sun. From hence you view the sea rather more distant, but more securely. This *cubiculum* and *triclinium*, by their projections, form an angle, which not only retains but augments the heat of the sun's rays. Here is my *hybernaculum* (winter room), and the *gymnasium* (room for exercise) for my family, which is never incommoded by any winds, but such as bring cloudy weather, and destroy the otherwise serene situation of the place. Adjoining to this angle is a *cubiculum* of a curved or round form, the windows of which admit the sun throughout its whole course. In the walls are inserted library frescoes, fur-

nished with books, more for amusement than study; close to this is the *dormitorium* (sleeping apartments), separated by a space having a covering of woodwork, which collects and distributes the vapour of the room in salubrious temperaments. The remainder of this wing is allotted to my servants and slaves, yet is generally sufficiently neat for visitors. On the right side of the *triclinium* is a most elegant *cubiculum*, with another large *cubiculum*, or moderate *cœnalis* (common eating or supper room), which receives light both from the sun and the sea; after this is a *cubiculum* with a *proœton* (servants' room), for height a summer, but for shelter a winter apartment, being screened from all winds; a wall separates another *cubiculum* with a *proœton*. There you enter the spacious and extensive *cella frigidaria* of the baths, against the walls of which two projecting *captisteria* afford sufficient space to swim in; near to this is the *unctuarium* (for anointing the body), and two other rooms, more elegant than sumptuous. Skilfully contrived, adjoins the *callida piscina* (warm bath), where those who swim enjoy a view of the sea. Not far distant is the *sphæristerium* (tennis court), of a circular form, which enjoys the warmest rays of the declining sun. Here arises a *turris* (pavilion, or summer-house)."

The chief distribution of a Roman house was into the *vestibulum*, the *atrium*, and the *cavadium*. The vestibule was an open space before the door, where the patricians heard the petitions of their clients or dependents. Next to it was the *atrium*, or large hall, into which the sleeping rooms and domestic offices looked. Beyond this was the *cavadium*, or open court, generally surrounded by a covered portico, into which the eating rooms, the baths, the library, and all the principal rooms of the family opened; in the centre there was usually a fountain. In the country and small towns the houses usually consisted of only one story; in Rome they consisted of several stories, and Augustus passed a law enacting that no house should exceed seventy feet in height. In many there was no roof. Glass windows were not of ancient date, as Seneca

speaks of the art of glazing as a luxury in his days. They had fire-places, as Horace attests—"Dissolve frigus, ligna super foco, large deponens." But this was not the case at Pompeii, because the warmth of the climate in Magna Græcia did not require artificial heat. Before glass was known, the *lapis specularis* was used. It separated into thin plates or *lamine*, and seems to have been a species of mica or talc. Pliny says it chiefly came from Spain. According to Dr. Adams the houses of the ancient Romans had only openings (*foramina*) in the walls to admit of light, covered with two folding leaves (*bifores valvæ*) of wood, and sometimes only a curtain, hence said to be joined when shut; sometimes by a net (*fenestra reticulata*). The *lapis specularis* for windows was first introduced under the early emperors, but its use was confined to the most opulent patricians for a long period. At first it was brought from Spain; afterwards, from Cyprus, Cappadocia, Sicily, and Africa. Paper, linen, cloth, and horn, were used for windows; hence, in reference to this last material, *corneum specular*. But the Romans used glass for mirrors (*specula*) before they used it for windows.



THE PARTING OF ACHILLES AND BRISEIS.

nor were they actually in the house.' Thus from this pompous waiting place, this (*stabulatio*) room to stand upon, they were called *vestibula*, great spaces, as I said before, left before the doors of the house for persons to wait in before they were admitted."

Anciently, the kitchen was in the *atrium*, and the family supped there. It contained pictures, statues, plate, and ancestral images. Here it was that patrons gave the *sportula* to their needy dependents. The *sportula* was a small portion of meat in a small basket; but it sometimes consisted of money, generally twenty-five asses, about one shilling and seven pence of our money. This kind of poor-rate was established by Nero, and suppressed by Domitian. At a late period of Roman history, when pride and luxury had superseded the simple and severe virtues of antiquity, the *atrium* was divided into several compartments, separated by hangings or curtains; and visitors, according to rank or friendship, were received into the more or less select apartments. Around the hearth in the *atrium* the *lares* were placed. They were waxen images, clothed with the skin of a dog, and on festivals were crowned with garlands. The *lares* represented the manes, or departed members of the family,

On the structure and arrangement of Roman houses there is a curious passage in Aulus Gellius. "I have observed," says that writer, "that some, even learned men, thought the *vestibulum* was the first part of the house, which is commonly called *atrium*. Cæcilius Gallus, in his book upon the meaning of words used in the civil law, says, 'that the vestibule is not either in the house, nor is it a part of the house, but is a vacant space before the gate of the house, through which there is an open way and access to the house; while on the right and left, between the gate and the house, which are united, to this way a space is left; and the gate itself is divided from this way by an area. Formerly, they who built large houses left a space before the gate, that there might be a vacancy between the road and the house. Persons who came to wait upon the master of the house stopped here before they were admitted, and thus neither stood in the street

and the skin of the dog was used for a covering, that animal being the symbol of fidelity. In the innermost recesses of the house, or *penetralia*, the *penates* were worshipped; these were of divine origin, as the lares were of human. The *impluvium* or *compluvium* was an open space in the centre of the house, which admitted light, and into which the rain fell. According to Vitruvius, it was not to be more than the third nor less than the fourth part of the atrium. The slave who had the charge of the atrium was called *atriensis*, and he exercised authority over all his fellow-slaves. The dormitories were of two kinds, either for sleeping by night or reposing by day. When any of the family desired to bask in the sun, they retired to the *solarium*. According to Dr. Adams, the Romans did not appear to have known the use of chimneys. They burnt wood steeped in the lees of oil, which contrivance diminished smoke. They used portable pans to carry hot embers to warm their apartments, and in the time of Seneca they made use of tubes for the same purpose. Their houses were covered with tiles (*tegulae*), some of which were two feet broad. When war was declared against Antony, the senators were taxed at four oboli, or ten asses, for every tile on their houses,

whether their own property or hired. The roofs were generally of an angular form, the highest point being called *fastigium*. A round roof was called *tholus*. The walls of the Roman houses were not wainscoted, but stuccoed, and they did not use wood for their floors, but small pieces of marble (*crustae*) of different kinds and colours, curiously joined together, or as mosaic. These were called *pavimenta sectilia*. They also employed small pebbles dyed with different colours; this flooring was known as *calculi* or *teserae*. The ceilings were often adorned with ivory, fretted or formed into raised work and hollows, *laqueata tecta*. *Laquearia*

from *lacus*, *lacunaria* from *lacuna*, the hollow interstice between the beams. Ceilings were frequently gilt or painted; but these appear to have been the luxuries of the rich, for Horace describes his house in much more modest terms:—

"Non ebur neque aureum
In meâ renidet domo lacunar.
Non trabes Hymettius
Ultimâ recisas Africâ."

The houses of Pompeii were not numbered, as in our streets and squares, but they bore distinctive inscriptions; and the same rule was observed in the temples, basilicas, dwelling-places of the magistrates, in warehouses, and in shops. Even on the postscenium of the theatre, the names of the actors and authors were inscribed. At the entrance to houses dogs were generally chained, and, in conspicuous letters, strangers were warned not to come within their reach: "*Cave Canem*"—beware of the dog.

Many articles of female ornament were discovered, as bracelets of gold, earrings, necklaces, chains, and rings set with precious stones; nor were the toilets deficient in those contrivances which

disguise the ravages of time and conceal the decay of beauty, for curious investigators have detected false teeth, false eyebrows, wigs, and rouge. We engrave a specimen of mirrors and a pin-box.* Two theatres were discovered at Pompeii, one devoted to the tragic, the other to the comic muse; on the east of the city stood a splendid amphitheatre, where the gladiatorial shows were exhibited. It was elliptical in figure, and of vast and noble proportions; the diametrical length from north to south, or from one of its grand entrances to another, was, according to the measurement of Eustace, 253 feet in the area, and 515 in the uppermost part of it; and sideways, from east to west, 133 feet in the lower, and 395 feet in the upper part. It is admirable for its solidity, elegance, and stateliness.

As specimens of Pompeian bassi-relievi, we have grouped together different subjects. The lower engraving, at the left hand, represents a warrior in his *biga*, or two-horse chariot. His slave leads the animals, which are spiritedly executed, and the figure of the slave is full of activity. To the right is a skeleton on a heap of stones, over which a young woman, in a stooping attitude, lets fall a funereal fillet. The dress of the female is very distinctive, and this

costume is said to be still preserved in secluded districts in the neighbourhood of Pompeii. Immediately above the *biga* is the representation of a sacrifice. The victim is a bull, led by a man who is to immolate it; he carries the sacrificial axe, and behind the bull is his attendant. In the centre is the altar, by which stands the sacrificer, his head encircled with a wreath, and wearing a flowing robe. In his hand he holds a small vessel, from which he is about to sprinkle the victim. Behind him is a boy, carrying a vase and a plate in either hand. Another figure sounds the double flute, and is followed by victors bearing the fasces. On the highest part of



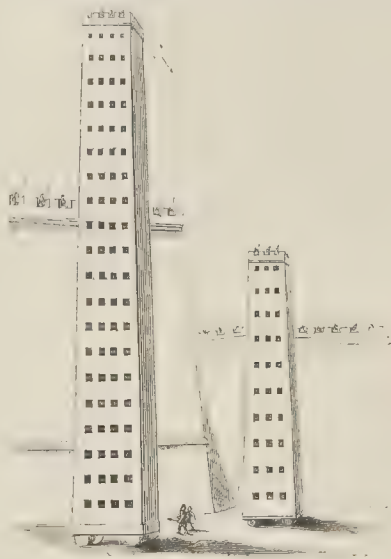
SPECIMENS OF BASSI-RELIEVI.

this engraving the bassi-relievi represent the dedication of a tomb. On the left hand are the magistrates; on the right the family to whom the tomb belongs; in the centre is a low altar, on which a youth deposits some offering, token, or memorial.

The walls of Pompeii which remain, prove that the lower and upper parts were built at different periods, the former imitating the ancient Etruscan style, where the stones were placed irregularly, and united by thick deposits of mortar; while the upper layers resemble the regular masonry of the Greeks. The solidity of the foundations denotes a period when wars were frequent, and the strength of fortifications was deemed a material consideration: in the more peaceful times which succeeded the usurpation of Augustus Cæsar, a lighter style of architecture was adopted, intended more for ornament than defence. We engrave a representation of the towers used in war, which, though contemptible when compared with the resources of modern engineering, were truly formidable at the time they were in use. The Greeks called these engines *helepoleis*, or city-takers. They were of gigantic

* See Engraving on next page.

size, for Vitruvius directs that the smallest of them should be not less than ninety feet high, and twenty-five feet broad; the top to be one fifth smaller, and to contain ten stories each, with



POMPEIAN TOWERS.

windows. The largest was 180 feet high, and thirty-four broad, containing twenty stories.

According to Mr. George Scharf, Jun., "the general result of the Pompeian excavations, up to the present time, may be thus summed up: three forums, nine temples, one basilica, a chalcidicum, three piazze, an amphitheatre, two theatres, a prison, double baths, nearly one hundred houses and shops, several villas, town walls, six gates, and twelve tombs." Those who desire minute particulars of all the discoveries hitherto made, may consult the great work of M. Mazois, the *Pompeiana* of Sir William Gell, and Mr. Donaldson's *Pompeii*. There is also a periodical work, the *Museo Borbonico*, replete with curious information. Further researches may disentomb more memorials of antiquity: but even should this not be the case, Pompeii will always possess a melancholy interest, not only for the classical traveller, but for every one who meditates on the instability of human greatness. In other lands we see the mouldering ruins of gradual decay, but on the Campanian shore we witness the mementoes of a sudden catastrophe. Death smote a whole population at a single blow, no sufficient warning allowing time for escape. Rich and poor, young and old, the strong and the feeble, met a common fate. The sentinel was seized at his post, the miser over his money-bags, the workman in the midst of his toil. "I noticed," says M. Simond, "a striking memorial of this mighty interruption in the forum opposite to the Temple of Jupiter. A new altar of white marble, exquisitely beautiful, and apparently just out of the hands of the sculptor, had been erected there; an enclosure was building all around; the mortar, just dashed against the side of the wall, was but half spread out; you saw the long sliding stroke of the trowel about to return and obliterate its own track—but it never did return; the hand of the workman was suddenly arrested, and, after the lapse of 1800 years, the whole looks so fresh and new that you would

almost swear the mason was only gone to his dinner, and about to come back immediately to smooth the roughness." Reflections such as these will ever invest Pompeii with an awful solemnity;



MIRRORS AND PIN-BOX.

and he who only gazes with curiosity and admiration on its recovered treasures, can never appreciate the moral lesson which its catastrophe is so well calculated to teach.



RECESS FOR FLOWER-STANDS.

THE GREEK COURT.

THE origin of Grecian architecture is involved in obscurity, and various opinions are entertained as to the type from which their first temples sprang. In the judgment of many, the earliest structures were of timber, and the circular form of columns is supposed to be an imitation of the rounded shape of trees; for it is argued, that had the primitive edifices been of stone the pillars would have been square. On the other hand, it is contended that the oldest buildings in Greece, yet discovered, display the characteristic massiveness of those of Egypt, from which country it is thence inferred that they were copied. Mr. Wilkins is, however, of opinion that the Greeks were indebted to the architects of Palestine, and points out the striking resemblance between the Temple of Jerusalem and that of Postum. Without offering any decided opinion on these conflicting theories, it is certain that the most ancient specimens of architecture—known as Cyclopean—were of rude workmanship, and are found in Greece, Italy, and Asia Minor. Their date has not been ascertained, but fable has attributed them to a race of giants, whose name they bear, it being supposed that ordinary men could not have brought into juxtaposition stones of such size and weight as may be seen in the treasury of Atreus, at Mycenæ, or the walls of Tiryns, in the Plain of Argos. So far as learned research has hitherto gone, authentic knowledge of Greek architecture can only be traced back to about six or seven centuries B.C.; from that period to the age of Alexander and his successors, we recognise the most brilliant period of artistic history, or from about the sixth to the third or fourth centuries B.C.

It falls not within our province to examine the various traditions which refer to the early population of Greece, or repeat what has been written of the Pelasgi and the Hellenes, the Dorians, Ionians, and Æolians. In reference to art, a modern writer has ably portrayed its leading features during the Homeric age, and we transfer his description to our pages. "Statuary was but little known, sculpture in marble not at all; for, besides the statue of Athene, at Troy, mention is only made of figures holding lights in the palace of Alcinoüs, and dogs at the gates, executed in gold and silver, the work of Hephestus. It is probable, therefore, that such statues as did exist were wrought and graven in metal. No traces, also, are to be found of the existence of painting. Colour was only used to decorate the productions of the inferior arts. Wools of different dyes were woven in patterns, or used with gold and silver threads in embroidering, and the figure-heads of ships and ivory horse trappings were stained in crimson and purple. In fact, epic poetry itself created and developed those faculties which afterwards produced the higher arts of sculpture and painting. Poetry did not borrow from art, but art from poetry. The poet's fancy conceived ideal forms, and embodied them in graphic and picturesque language; the artist realised these descriptions, and presented their results in a form to be apprehended by the external senses. Even in the lower mechanical arts it is scarcely possible that anything existed completely corresponding with the Homeric descriptions; they were founded in fact, and, doubtless, accurate enough, not to strike his hearers as unnatural impossibilities, but they had not their exact counterparts. Even modern genius, with all the appliances of modern Art, cannot realise the endless varieties of the Homeric shield. It must not, therefore, be supposed that ancient plastic art could execute in all its fulness what the rich and vivid fancy of Homer could imagine. Nevertheless, it may be repeated, Art flourished, and its productions were both ingenious and beautiful. However much the descriptions may have surpassed the reality, the poet's eye, as well as that of his hearers, must have been accustomed to splendour and magnificence, or else he could neither have described, nor they understood, the palaces of Priam and Odysseus, or the house and gardens of Alcinoüs, with all their rich architecture and luxurious furniture. It may be assumed, therefore, that the works of the famed Sidonian looms, said to have been imported to Troy by Paris, were well known to the Greeks; that furniture had some of the elegance of Odysseus' bed, of the tripods described in the *Iliad*, and of the ivory work spoken of in the *Odyssey*. Armour was richly ornamented like that of Agamemnon and Ulysses; and articles of dress, both male and female, embroidered with tasteful designs, like that of Odysseus, and that presented by Antinous to

Penelope. Nor were the useful arts less understood than the ornamental. Their lands were skilfully and industriously cultivated. They ploughed with mules and oxen, and, like the Israelites, used oxen to tread out the corn. The grain was ground in hand-mills by women, as it was in Palestine in our Saviour's days, or pounded with a pestle and mortar. Polyphemus made cheese, and separated the curd from the whey by means of the acid juice of figs. They melted metals in furnaces, and increased the heat with bellows. They fished with net and line, although fish were not esteemed as an article of food. Their tools, used by the shipwright, the wheelwright, and the carpenter, comprise all the common tools now in use, except the saw; and, lastly, the probability is that the art of writing, which had been long practised by the most civilised nations of the East, was also to the Greeks not entirely unknown. Their cities were strongly fortified, for in architecture, or at least in masonry, they had made great advances."

In priority of date Dædalus is considered the earliest of Greek sculptors. He is supposed to have been a descendant of Erectheus, King of Athens, and to have flourished some fourteen hundred years before the Christian era, though some writers reduce the period to one thousand years. Homer, while praising the excellence of the figures worked by Vulcan on the shield of Achilles, compares them to other figures sculptured by Dædalus for Ariadne. Pausanias ascribes many statues to this artist which existed when he wrote, that is in the second century of the Christian era. According to Diodorus Siculus, Dædalus was the first sculptor who gave eyes to his figures, and represented the limbs and arms correctly and distinctly. Before his time, the same historian tells us, that artists made the eyes of their figures closed, the arms and hands hanging close to their sides. Dædalus murdered his nephew Talos, of whose skill he was jealous. For this foul deed he was condemned to death by the Areopagus. A fugitive to Crete, he there found favour with King Minos, for whom he built the labyrinth, but forfeited the esteem of his protector by aiding, through his art, the criminal passion of Pasiphaë. Forced again to seek shelter in another country, he fled with his son Icarus, who was drowned in the sea which bears his name. Hence the fable of this youth soaring on waxen pinions, melted by the sun. Dædalus found a home in Sicily.

Labyrinth, in its primitive sense, means any perplexed and twisted place. As architectural structures, antiquity records four celebrated labyrinths: one in Egypt, a second in Crete, a third at Lemnos, and a fourth, erected by Porsenna, in Etruria. That of Lemnos is highly praised by Pliny. It is said that Dædalus visited Egypt to examine the Egyptian labyrinth, and took it as a model for the one he constructed in Crete. Herodotus speaks of the Egyptian labyrinth in the following terms:—"The temples of Epheusus and Samos may justly claim admiration, and the Pyramids may be compared to many of the magnificent structures of Greece, but even these are inferior to the labyrinth. It is composed of twelve courts, all of which are covered; their entrances are opposite to each other, six to the north and six to the south; one wall encloses the whole. The apartments are of two kinds. There are fifteen hundred above the surface of the ground, and as many beneath, in all three thousand. Of the former, I speak from my own knowledge and observation; of the latter, from the information I received. The Egyptians who had the care of the subterranean apartments would not suffer me to see them, and the reason they alleged was, that in these were preserved the sacred crocodiles and the bodies of the kings who constructed the labyrinth; of these, therefore, I presume not to speak, but the upper apartments I myself examined, and I pronounce them amongst the greatest efforts of human industry and Art. The almost infinite number of winding passages through the different courts excited my warmest admiration. From spacious halls, I passed through smaller apartments, and from them again to large and magnificent courts, almost without end. The ceilings and walls are all of marble, the loftier richly adorned with the finest sculpture; around each court are pillars of the whitest and most polished marble; at the points where the labyrinth terminates stands a pyramid 160 cubits high, having large figures of animals engraved on its outside, and the entrance to it is by a subterraneous path."

* Browne's History of Greek Classical Literature, vol. i. p. 118, *et seq.*

In connection with the colossal scale on which the labyrinth was built, we may observe that the ancients entertained ideas of vastness and magnitude in architecture far surpassing those of the moderns. It is recorded by Plutarch that Stesicrates proposed to Alexander the Great to convert Mount Athos into a statue of that prince. This would have been in circumference no less than 120 miles, in height ten miles. The left arm of Alexander was to have formed the base of a city capable of containing ten thousand inhabitants; the right was to have held an urn, from which a river was to empty itself into the sea.

Hephestus followed Dædalus, or may have been his contemporary; but some writers deny that he was an individual, and contend that Hephestus was a mere name, applied generally to workers in metal. Smelis, or Scemlis, a native of Ægina, who built the Temple of Juno, in Samos, and her statue, is next in date. Hero-

have my affairs sometimes flattering, and sometimes perverse; I would wish to pass through life with the alternate experience of good and evil, rather than with uninterrupted good fortune. I do not remember to have heard of any man remarkable for a constant succession of prosperous events whose end has not been calamitous. If, therefore, you value my counsel, you will provide this remedy against the excess of your prosperity. Examine well what thing it is that you deem of the highest consequence to your happiness, and the loss of which would most afflict you. When you shall have ascertained this, banish it from you, so that there may be no possibility of its return; if after this your good fortune should still continue without diminution or change, you will do well to repeat the remedy I propose."

Polycrates, having a high opinion of the sagacity of Amasis, and appreciating the sincerity of his friendship, determined to follow



FAÇADE OF THE GREEK COURT.

dotus calls Theodorus of Samos the first statuary on record. The following mention is made of him by Pliny:—"Theodorus, who constructed the labyrinth of Samos, made a cast of himself in brass, which, independently of its being a perfect likeness, was an extraordinary effort of genius. He had in his right hand a file; with three fingers of his left he held a carriage drawn by four horses: the carriage, the horses, and the driver, were so minute, that the whole was covered by the wings of a fly." It was this Theodorus who engraved the famous signet-ring of Polycrates, the tyrant of Samos, on which Herodotus has recorded the following amusing narrative. Amasis, King of Egypt, wrote thus to Polycrates:—"The success of a friend and an ally fills me with particular satisfaction; but as I know the invidiousness of fortune, your extraordinary prosperity excites my apprehensions. If I might determine for myself, and for those whom I regard, I would rather

his advice. What he valued most of all his treasures was the signet-seal made for him by Theodorus the Samian, the son of Telecles, which, Herodotus says, was an emerald set in gold. Polycrates carried this into the open sea, and, in the presence of his attendants, threw it into deep water. Returning to the shore, he regretted his loss. In the course of a few days a fisherman caught a fish of such size and beauty that he deemed it a proper present for his prince. He went, therefore, to the palace, and demanded an audience, and presented the fish to Polycrates. This fish, on being opened, contained in its stomach the signet-ring which had been cast into the sea. To this story the learned Mr. Beloe has appended the following note:—"Clemens Alexandrinus says that it (the precious stone) represented a lyre. Pliny says it was a sardonyx, and that in his time there existed one in the Temple of Concord, the gift of Augustus, affirmed to be that of





Polycrates. Solinus also asserts that it was a sardonyx; but Herodotus expressly tells us that it was an emerald. At that period the art of engraving precious stones must have been in its infancy, which might probably enhance the value of the ring to Polycrates. It is a little remarkable that the moderns have never been able to equal the ancients in the exquisite delicacy and beauty of their performances on precious stones. Perhaps it may not be too much to add that we never attained to the perfection with which they executed all works in miniature. Pliny says that Cicero once saw the *Iliad* of Homer written so very finely, that it might have been contained 'in nucē'—in a nutshell. Aulus Gellius mentions a pigeon made of wood, which imitated the motions of a living bird; and Ælian speaks of an artist who wrote a distich in letters of gold, which he enclosed in the rind of a grain of corn."

In conjunction with Theodorus of Samos, Rhœcus, the architect, invented the art of making moulds with clay; they were also the first who made casts in brass, of which they formed statues. Pausanias says, that upon a pedestal above the altar of Diana, called

The destruction of Athens by the Persians proved fatal to many of the oldest monuments of art, and, among these, to a temple called Hecatompædon. Under the administration of Pericles, this injury was repaired by building the Parthenon, dedicated to Minerva, the divine patroness of Athens. On this famous structure the greatest talent was employed. Ictinus and Callicrates were the architects; Alcámenes and Phidias the sculptors. Modern critics and antiquarians, however, have decided that the entire structure was designed by Phidias, and that the other artists worked out his plans under his immediate superintendence. The account which Pausanias gives of this superb edifice is very meagre, but his authority is so high that we must transcribe his brief description:—"But in that temple, which they call the Parthenon, and in that part of the *tortoise* which they call *aquile*, there are statues pertaining to the nativity of Minerva; and in the hinder part there is a representation of the contest between Neptune and Minerva about Attica. The statue of the goddess is formed from ivory and gold, and the image of a sphinx is placed



INTERIOR OF THE GREEK COURT.

prototrophia, there is a statue by Rhœcus; and he tells us that the "Ephesians call it *Night*," probably an allusion to the moon when below the visible horizon.

Dipœnus and Scyllis are supposed to be the first sculptors who worked on marble. Some are of opinion, says Pausanias, that Dædalus married a daughter of Gortynis, by whom he had Dipœnus and Scyllis. The same writer states that at Cleonæ, a city of no great magnitude, on the road from Corinth to Argos, there was a temple dedicated to Minerva, and that the statue of the goddess was made by them. They had several pupils, who attained to eminence, amongst whom Pausanias mentions the Lacedæmonian Dontas, who wrought the offerings for the treasury founded by the Megarenses at Olympia; the Lacedæmonian Doryclidas, who sculptured the statue of Themis, which stood in the Temple of Juno, at Elis; the Lacedæmonian Theocles, who executed the Hesperides, five in number, at the same place; and Tectæus and Angelion, who taught the art to Callon Æginetes, who made the statue of Apollo for the Delians.

on the cone of her helmet. But when I describe the Boeotian affairs, I shall relate the particulars concerning the sphinx. On each side of her helmet, too, there are griffins; and these griffins are said by Aristæas the Proconnesian, in his verses, to have fought for the sake of gold with the Arimaspi, who dwell above the Iædones. The gold, indeed, which the griffins guard, the poet says, was sent from the earth; but the Arimaspi had each of them but one eye from their birth. He adds that the griffins are like lions, but that they have the wings and beak of an eagle. And thus much concerning griffins: but the statue of Minerva is erect, with a garment reaching to her feet. There is a head of Medusa, fashioned from ivory, in her breast, and a Victory of about four cubits in length. In her hand she holds a spear; a shield lies at her feet; and near her spear there is a dragon, which may perhaps be Erichonius; and at the base of the statue the generation of Pandora is represented. Hesiod, indeed, and other poets, assert that Pandora was the first woman, and that the race of women had not any existence prior to Pandora. In this I remember to have seen only one statue of the

Emperor Hadrian; and in the entrance to the temple a statue of Iphicrates, who exhibited many and admirable works. Beyond the temple there is a brazen Apollo, which they report was made by Phidias; but they call the statue *Parnopius*, because the god once banished from this country locusts, which greatly injured the land."

As the Sphinx to which Pausanias alludes is very different from the sphinx of Egypt, we shall give the substance of what the historian says in the *Bæoties*. On proceeding from the plain of Tænerus, in Bæotia, where stood the Temple of the Cabiri, the traveller arrives at a mountain, which was the home of the Sphinx, from whence she rushed to destroy those who could not solve her riddles. Another account was, that she was a pirate, pillaging vessels at sea, till Œdipus destroyed her by an army which he led from Corinth to the mountain. "It is also said," writes Pausanias, "that she was the bastard daughter of Laius, and that her father taught her the oracle which was given to Cadmus at Delphi, through his kindness towards her. Prior to the Theban kings, indeed, no one was acquainted with the meaning of the oracle, and these in succession unfolded it to each other. As often, therefore, as any dispute arose about the kingdom, the neighbouring princes came to consult Sphinx. Laius, indeed, had sons by his mistresses; but they say that the meaning of the oracle given by the Pythian deity was only known to Epicaste, and the children which Laius had by her. They add that the brothers were circumvented by the sophisms of Sphinx; and that upon her inquiring whether, if they were the sons of Laius, they knew the oracle given to Cadmus, if they answered in the negative, she condemned them to death, as not being entitled by their birth to the kingdom. Lastly, it is said that the interpretation of the oracle was given to Œdipus in a dream, who was by this means enabled to solve the riddle of Sphinx."

The curious reader may ask, Why was the image of a sphinx placed on the cone of the helmet of Minerva? The Egyptians placed a sphinx in the vestibule of the temples of Isis; and Minerva is one of her forms in the Greek mythology. The learned Mr. Taylor, called the Platonist, in his notes appended to his translation of Pausanias, says that by the sphinx the ancients intended to represent "Phantasy," which Aristotle terms "passive intellect." Mr. Taylor proceeds thus:—"By the sphinx having the body of a dog, the discriminating power of the phantasy is implied; for a dog, as we have shown before, is the image of the discriminating power of the soul. By her having the tail of a dragon and the claws of a lion, the communication of the phantasy with desire and anger is signified. Her wings are images of the elevating powers which the phantasy naturally possesses; for it is re-elevated, in conjunction with the returning soul, to the region everywhere resplendent with light. But the riddles of the sphinx are images of the obscure and intricate nature of the phantasy. He, therefore, who is unable to solve the riddles of the sphinx—i.e. who cannot comprehend the dark and perplexed nature of the phantasy—will be drawn into her embraces, and torn to pieces; i.e. the phantasy in such a one will subject to its power the rational life, cause its indivisible energies to become divisible, and thus destroy as much as possible its very essence. But he who, like Œdipus, is able to solve the enigmas of the sphinx, or, in other words, to comprehend the dark essence of his phantasy, will, by illuminating its obscurity with the light of intellect, cause it, by becoming lucid throughout, to be no longer what it was before. . . . But opinion may be called the vestibule of the rational soul, and the rational soul is, as it were, the temple of that intellectual illumination which proceeds from Minerva. The divine soul is suspended from the deity of Minerva, and which may be called her temple."

We may be assured that the fables of antiquity had an occult religious meaning, though we may not in all cases be enabled to discover their true interpretation. The architects, sculptors, and painters of olden times reproduced these fables and traditions in their buildings, statues, and pictures; and the emblems and symbols they connected with them spoke a language which their contemporaries understood. The learned and critical Winckelman, in his *History of Art*, observes, "that the form of each goddess is so uniformly *sui generis* as to lead one to suppose that all the Greek artists modelled their designs by some law or standard, which all of them scrupulously observed. The figure and expression of Diana, Venus, Juno, Pallas, and others, belong specially to each goddess, and would be out of place and keeping if transferred to

them indiscriminately." But though Winckelman saw the fact with the eye of an artist, he does not appear to have known the reason for this variety of treatment, which really proceeded from the religious spirit of antiquity, ever anxious to adapt the symbol to the celestial type, the more powerfully to arrest attention, and convey specific ideas to the people. Thus the expression of Juno was majestically proud. Minerva displays the calm serenity of philosophic meditation engaged in lofty speculations. Venus beams with a brilliant softness, languishing yet exciting—an image of amiable loveliness. Ceres presents the attraction of rustic beauty, healthful and jocund, but less delicate and polished than Venus. Diana, braced by exercise, fearless of danger, and habituated to the toil of the chase, exhibits a more robust and masculine style of beauty. Vesta is represented as a matronly housewife, attending to her domestic affairs by her fireside.

To return to the Parthenon as a building. When Sir George Wheler and Dr. Spon visited Athens, in 1676, this temple was entire, and Sir George published the following description of it:—

"The Parthenon, or great Temple of Minerva, is situated about the middle of the citadel, and consists altogether of admirable white marble. The plane of it is above twice as long as it is broad, being 217 feet nine inches long, and ninety-eight feet six inches broad. It has an ascent every way of five degrees, or steps, which seem to be so contrived as to serve as a basis to the portico, which is supported by channelled pillars of the Doric order, erected round about them, without any other bases. These pillars are forty-six in number, being eight to the front and as many behind, and seventeen on each side, counting the four corners twice over to be deducted. They are forty-two feet high, and seventeen feet and a half about. The distance from pillar to pillar is seven feet four inches. The portico beareth up a front and frieze round about the temple, charged with historical figures of admirable beauty and work. The figures of the front, which the ancients call the eagle (*aquila*), appear, though from that height, of the natural bigness, being in entire relief, and wonderfully well carved. Pausanias saith no more of them than that they concern the birth of the goddess Minerva. There is a figure that stands in the centre of it, having its right arm broken, which probably held the thunder. Its legs straddle at some distance from each other, where without doubt was placed the eagle; for the beard, and the majesty which the sculptor has expressed in the countenance, do sufficiently show it to have been made for Jupiter. At his right hand is another figure, covered halfway up the legs, in a posture as coming towards Jupiter, which, perhaps, was a Victory, leading the horses of the triumphant chariot of Minerva, which follows it. The horses are made with such great art, that the sculptor seems to have outdone himself by giving them a more than seeming life, such a vigour is expressed in each posture of their prancing and stamping, natural to generous horses. Minerva is next represented in the chariot, rather as the goddess of learning than of war, without helmet, buckler, or a Medusa's head on her breast. Next behind her is another figure of a woman with her head broken off; who it was is uncertain. But my companion made me observe the two next figures, sitting in the corner, to be of the Emperor Hadrian and his empress Sabina. At the left hand of Jupiter are five or six other figures; my companion taketh them to be an assembly of the gods, where Jupiter introduceth Minerva, and owneth her for his daughter. The postic, or hind front, was adorned with figures, expressing Minerva's contest with Neptune about naming the city of Athens, but now all of them are fallen down, one part of a sea-horse excepted. The architrave is also charged with a basso-relievo at several distances, divided into squares of two or three feet broad, and three or four feet high. Within the portico on high, and on the outside of the cells of the temple itself, is another border of basso-relievo around about it, or at least on the north and south sides, which, without doubt, is as ancient as the temple, and of admirable work, but not so high a relievo as the other. Thereon are represented sacrifices, processions, and other ceremonies of the heathen worship. The cella of the temple without is 158 feet long, and broad sixty-seven feet. Before you enter into the body of the temple from the front is the pronaos, whose roof is sustained by six channelled pillars of the same order and bigness as those of the portico, and contains near the third part of the cella—to wit, forty-four feet of the length. We observed, in place of one of the pillars, a great pile of stone and lime, of most rude work, which, they told us, the Kislar Aga had ordered to be so done to help to support the roof, because he could

never find a stone big enough to supply the place of the old pillar broken down, although he had spent 2000 crowns to do it. From the pronaoes we entered the temple by a long door in the middle of the front. But my companion and I were not so much struck by the obscurity of it as M. Guilliter, because the observations we had made on other heathen temples did make it no new thing to us. When the Christians consecrated it to serve God in, they let in the light at the east end, which is all it yet hath; and not only that, but made a semicircle for the holy place, according to their rites, which the Turks have not yet much altered. This was separated from the rest by jasper pillars, two of which on each side still remain. Within this chancel is a canopy, sustained by four porphyry pillars, with beautiful white marble chapters of the Corinthian order; but the holy table under it is removed. Beyond the canopy are two or three degrees, or steps, one above another in a semicircle, where the bishops and presbyters used to sit in time of communion, upon certain solemn days. The bishop sat in a marble chair above the rest, which yet remaineth above the degrees against the window. On both sides, and towards the door is a kind of gallery, made with two ranks of pillars, twenty-two below and twenty-three above; the odd pillar is over the arch of the entrance which was left for the passage. They showed us the place where two orange-trees of marble formerly stood, which, being taken thence to be carried to Constantinople, the vessel miscarried with them. The roof over the altar and choir, added to the temple by the Greeks, hath the picture of the holy virgin on it, of mosaic work, left yet by the Turks."*

Phidias afterwards left Athens; and at Olympia, a town in the territory of the Eleans, where those people had dedicated a temple to Jupiter out of the spoils they had taken from the Pisæans, and other neighbouring people, Phidias made a statue of the god. If Pausanias furnishes but scanty evidence about the Parthenon, he is very copious respecting the Olympian temple which was built by Libon, a native of the place. It was Doric in style, and enclosed by a circle of pillars. The material used was the stone of Paros, which the country produced. From the bottom area to the eagles which sustained the roof, the height was sixty-eight feet; its breadth ninety-five feet; and its length 230. The roof did not consist of tiles, but of marble from the Pentelican quarries, cut in the shape of tiles—an invention ascribed to the son of Byzas, descended from Latona. At the extremity of the roof of the temple, a brazen kettle hung from each side, and in the middle of the roof was a golden Victory; beneath it a golden shield, in which the head of the Gorgon Medusa was sculptured. An inscription on the shield proved that it was a joint votive offering from the Athenians, Argives, Ionians, and Spartans. Twenty-one golden shields fixed to the zone which girded the pillars were afterwards dedicated by the Roman consul Mummius, after he captured Corinth. The sculptures of an historical character were numerous and beautiful. On the right hand of the statue which we shall presently describe was a statue of Enomæus, with a helmet on his head, and near to him his wife Sterope. Myrtilus, the charioteer of Enomæus, is seated on the chariot before the horses, which are four in number. Two grooms are in attendances. On the left hand of the statue of Jupiter is Hippodamia, together with the charioteer of Pelops. On the top of the temple, the rivers Cladeus and Alpheus were represented. Pausanias states that whatever the front part of the summit contains is the work of Pœonius, who was born at Mende, a town of Thrace; but all that is in the back part was the work of Alcamenes. Within the summit were the Lapithæ, fighting with the Centaurs at the marriage of Pirithous. In another part Theseus is seen revenging himself on the centaurs with an axe; and there were two centaurs, one of whom carries away a virgin, and the other a boy in the flower of his youth. "It appears to me," observes Pausanias, "that Alcamenes made these, having learnt, from the poems of Homer, that Pirithous was the son of Jupiter, and knowing that Theseus was the fourth descendant from Pelops. In this temple, too, many of the labours of Hercules were represented; above the doors was the hunting of the Erymanthian boar; the actions of Hercules against Geryon, and the same hero about to take upon himself the burden of Atlas in supporting the globe. Above the back of the doors he was represented taking away the girdle of the Amazon, and this was accompanied by the stories of the stag and Gnosian bull, the Lernean hydra, the Stymphalian birds, and the Nemean lion. Within the temple were

pillars sustaining porches at a considerable height from the ground, through which a passage led to the statue of Jupiter."

The god sat on a throne of ivory and gold, and is adorned with a crown on his head, made in imitation of a branch of the wild olive-tree. In his right hand he held a Victory, also made of ivory and gold, and a crown was on its head. His left hand wielded a sceptre of beautiful workmanship, in the composition of which all metals were blended together. The bird which sat on the sceptre was an eagle. The sandals of the god and his robe were of gold, and in the latter of these various animals and the lily were represented. The throne itself was variegated with gold and precious stones, with ebony and ivory, and adorned with pictures and sculptures of animals. It contained four Victories, each of which was represented dancing at the foot of the throne. Two other Victories were at the extremities of the feet of the god; there also was the Theban youth, in the act of being forced away by sphinxes, and under the sphinxes Apollo and Diana piercing with their arrows the children of Niobe. A variety of historical paintings embellished this scene, which Pausanias says were executed by



HEAD OF OLYMPIAN JUPITER.

Panænus, the brother of Phidias, who also painted for the Athenians, in their porch, the battle of Marathon. This superb statue of Olympian Jove was made by Phidias, as the inscription at the foot of the god testified: "Phidias the Athenian, the son of Charmidas, made me."

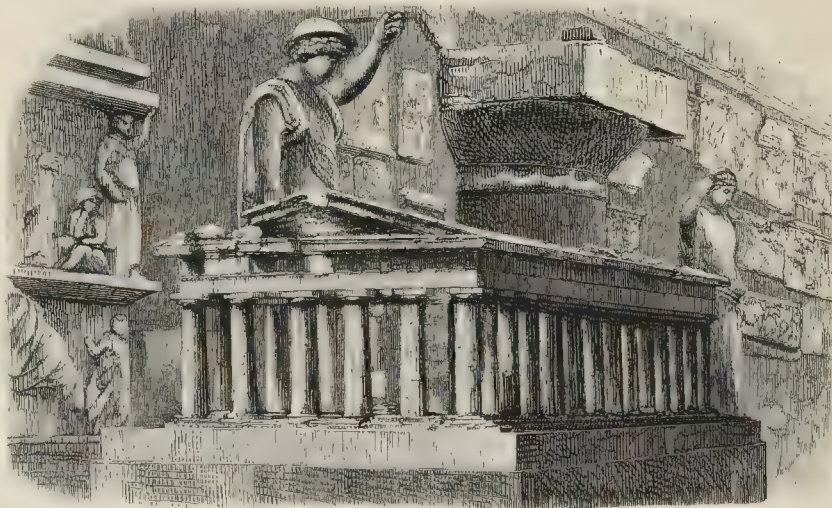
For the higher parts of the throne, above the head of the statue, Phidias also made on one side three Graces, and on the other as many Hours. In the base, under the feet of Jupiter, called the Thranion, or support of the feet, there were golden lions, and a representation of the battle of Theseus against the Amazons. In the other base, which supports the throne itself, appeared a golden statue of Apollo ascending his chariot, Jupiter and Juno, attended by one of the Graces; after which follow Hermes, and then Vesta; then follows Love, receiving Venus rising out of the sea, and the goddess of persuasion crowning her. Next appear Apollo, Diana, Minerva, and Hercules. Near the end of the base are Amphitrite and Neptune, and the moon driving a horse. Such is the account of this temple transmitted by Pausanias, who described what he saw, not what he had heard, and we have almost textually copied the original, because every dependence may be placed on its fidelity. Surely nothing can be more magnificent than this description of ancient artistic skill, in invention, copiousness, variety, pomp of

* See Engraving of the Model of the Parthenon, page 112

grouping and combination, appropriateness in history, mythology, and tradition, perfect finish in all details, comprehensiveness of design, and elaborateness in execution. That Phidias prided himself on this work may be inferred from the fact that when his labours were completed, he offered up a prayer to Jupiter, entreating him to signify whether the work was acceptable to his supreme majesty. No sooner was prayer ended than the pavement of the temple was struck with lightning, a proof that the ruler of Olympus was satisfied. The pavement in front of the statue was covered with black, not with white marble. "This black pavement," says Pausanias, "is circularly enclosed with a fountain of Parian marble, which is the repository of oil. For the statue of Jupiter is rubbed over with oil, in order to prevent the ivory from suffering any injury through the marshy nature of the grove. On the contrary, in the tower of the Athenians, water and not oil is found to be useful to the statue of Minerva, who is called the Virgin. For as the tower is in a very squalid condition, through its great height, the statue, which is made of ivory, requires to be sprinkled over with water. But when I was in Epidaurus, and inquired why neither water nor oil was used for cleaning the statue of Æsculapius, I was informed by those about the temple that the statue of the god, and the throne on which it stands, are placed over a well."

Saturn and vanquished the Titans. In other traditions it is asserted that Apollo once outran Mercury in the course, and vanquished Mars in boxing; and that on this account the music of the Pythian pipe was introduced into the dance of the *quinquertium*—the verses sung to the pipe being sacred to Apollo, he having carried away the first prize in the Olympic games. Originally there was only one judge, or president, who awarded the prizes; then two were appointed; afterwards nine, called *hellenodici*. Three of these presided over the course with horses; the same number over the *quinquertium*; the rest over the other games. A tenth judge was next added; finally, in the 103rd Olympiad, the Eleans were divided into twelve tribes, and one judge of the games was appointed out of each tribe. At length the Eleans lost part of their territory in battle against the Arcadians, when they were divided into eight tribes, and, in consequence, the *hellenodici* were reduced to the same number. However, in the 108th Olympiad, they were again raised to ten, and that state of things continued to the time of Pausanias, from whom the preceding account has been derived.

The Olympic games being one of the most sacred institutions of Greece, every pains were taken to give them the most august character. The judges even consulted foreigners to suggest im-



MODEL OF THE PARTHENON.

These are curious details, for which the general reader, indeed, may care little, but they are interesting to the antiquarian.

The art of the sculptor was most powerfully encouraged in Greece by the Olympic games, for, as we shall presently observe, the statues of the victors were carved by the most eminent statuary. According to the traditions of Elis, Saturn first obtained the government of heaven; and those men who were called the golden race, raised a temple to him in Olympia. Afterwards, when Jupiter was born, his mother, Rhea, committed him to the care of the Dactyli Idæi, who were also called the Curetes: they came from Ida, a mountain in Crete, their names being Hercules, Pæoneus, Epimedes, Iasius, and Idas. Hercules, the eldest of them, proposed the contest of the race to his brothers, and crowned the conqueror with the leaves of the wild olive-tree. The traditions add that the Curetes had a great quantity of these leaves, because their beds were composed of them; and this tree, they affirm, was brought by Hercules from the Hyperboreans to Greece. The glory, therefore, of having first established the Olympic games is given to the Idæan Hercules, who gave them the name of Olympic. On this account they were celebrated every fifth year, because the brothers were five in number. But there are other traditions; some affirm that Jupiter wrestled with Saturn for dominion in this place; others that Jupiter instituted the games after having dethroned

provements. Herodotus (*Euterpe*) tells us that during the reign of Necos ambassadors arrived in Egypt from the Eleans:—"This people boasted that the establishment of the Olympic games possessed every excellence, and was not surpassed even by the Egyptians themselves, though they were deemed the wisest of mankind. On their arrival they explained the motive of their journey, in consequence of which the prince called a meeting of the most learned of his subjects, at which the Eleans described the regulations they had established, and then asked if the Egyptians could recommend any improvement. After some deliberation the Egyptians inquired whether the fellow-citizens of the Eleans were permitted to contend in those games. They were informed in reply that all the Greeks, without any distinction, were permitted to contend. The Egyptians observed that this must of course lead to injustice, for it was impossible not to favour their fellow-citizens in preference to strangers. If, therefore, the object of their voyage to Egypt was to render their regulations perfect, they should only suffer strangers to contend in their games, and particularly exclude the Eleans."

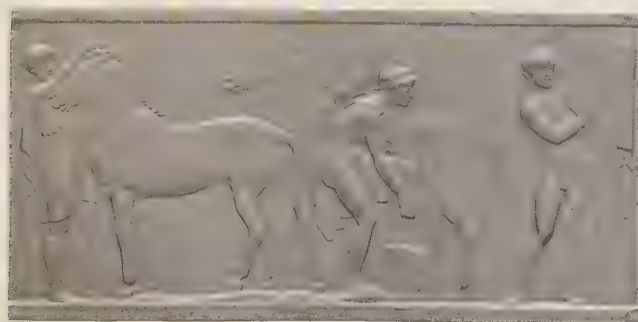
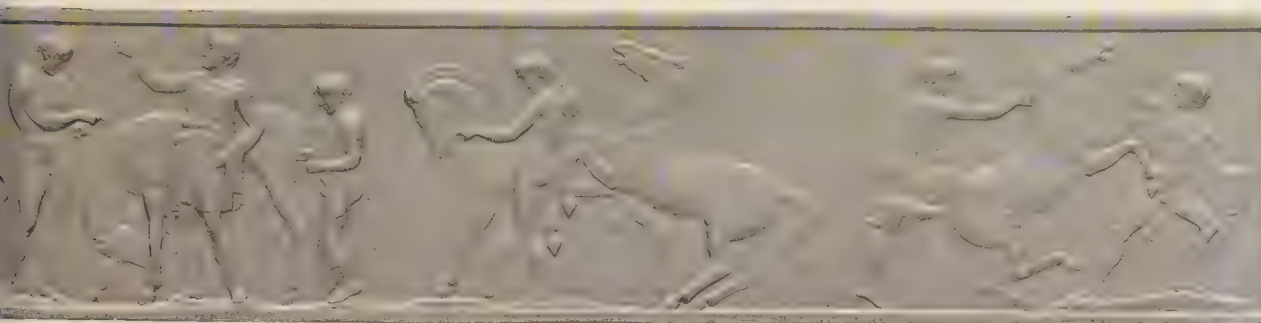
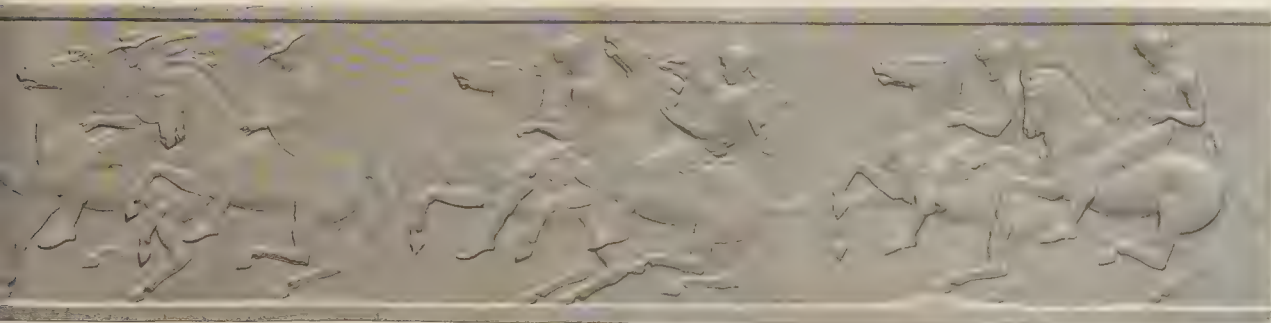
That advice was not followed; but, with rare exceptions, the strictest impartiality prevailed. When the Greeks became subject to the Romans, some of the great men of Rome occasionally wrote to the judges in behalf of some of the competitors, but the judges made it a point never to open such letters till after the prizes had



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been decided. The decisions might be appealed from, and the judges might be accused before the senate at Olympia, who sometimes set aside their award. Those who were elected hellanodica were compelled to reside during six months, successively, in a building appropriated to their sole use, at Olympia, named *Hellandicaon*, in order to instruct themselves previously to entering on their duties.

The most celebrated of the *athleta* who contended in these games was Milo of Crotona, whose statue was made by Dameas the Crotonian. He was six times victorious in wrestling in the Olympic games: his strength was prodigious. He is said to have carried his own statue to Altis; and to have held a pomegranate so fast in his hand, that it could neither be forced from him by another person, nor could he himself dismiss it from his grasp. Such is the account given by Pausanias. Milo would bind his forehead with a fillet or a crown, and, compressing his lips and holding his breath, would so fill the veins of his head with blood, that he would burst the cord or fillet through the strength of his veins. It is also recorded of this *pancratiast*, or wrestler, that having let fall against his side that part of the arm which reaches from the shoulder to the elbow, he would extend the other part, which reaches from the elbow to the fingers, with his thumb turned upwards, and his fingers placed close together: when his hand was in this position, no one, by the greatest exertions, could separate his little finger from the rest. Larcher relates the following anecdote of that

a young bull, four years old, upon his shoulders some distance, killed it, divided it into portions, and ate the whole of it himself in the course of one day. Milo met a cruel death. Happening on the borders of Crotonia to meet with a withered oak, into which wedges had been driven in order to separate the wood, he endeavoured, through confidence in his strength, to tear the oak asunder. The wedges giving way, Milo was caught by the closing parts, and, in that defenceless state, was torn in pieces by the wolves, which abounded in the neighbourhood. Such was his miserable fate. It is doubtful at what period he lived, but Aulus Gellius says he was crowned victor in the games in the 50th Olympiad.

PHIDIAS.—At Altis, where the statues of the victors were ranged, Phidias made a remarkable one of a boy whose head was bound with a fillet, and Pausanias says of it, "We do not know of any other person whose image was made by Phidias"—that is, taken from the life. This great sculptor executed in ivory and gold a statue of the Celestial Venus, in a temple dedicated to her at Elis. This statue stood with one of its feet on a tortoise. Near this place there was also a brazen statue of Venus, which stood on a fountain, within a grove; but this was not the work of Phidias, but of Scopas. It

stood on a brazen goat, and was known as "Venus the Popular." In the town of Elis there was a temple sacred to Minerva; and her statue of ivory and gold was made by Phidias. There was a cock on the helmet of the goddess, because that bird is always



INTERIOR OF THE GREEK COURT.

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BUST OF MINERVA.

extraordinary man, on the authority of Athenæus. Another famous wrestler, named Titormus, disputed with Milo which could the sooner devour an entire ox: incredible as it may seem, Milo carried



BUST OF ASPASIA.

ready to fight. At Pellene, in Achaia, Phidias made another statue of Minerva, in ivory and gold; and this appears to have been one of his earliest productions, for Pausanias says that the Pellene affirm

that Phidias made it "before he made that for the Athenians, which is in their tower, or that which is among the Plateenses." He adds, "the Pelleni assert that the adytum of Minerva extends to the profundities of the earth; that this adytum is under the basis of the statue; and that a moist vapour ascends from the adytum, which is very serviceable to the ivory of the statue." The statue this sculptor made for the Plateenses was called "Minerva Arcia," or the Martial, and placed in her temple, which was built with the spoils given to the Plateenses by the Athenians, after the battle of Marathon. The statue of the goddess was made of wood, and gilt, except the face and the extremities of the hands and feet. That which Phidias made for the Athenians was erect, a garment reaching to her feet. A head of Medusa, fashioned from ivory, was on her breast, and a Victory, four cubits in length. In her hand she held a spear, a shield was at her feet, and near the spear was a dragon; and the generation of Pandora was represented on the base of the statue. This statue was brazen. He also made another statue of Minerva, which was called "Minerva Lemnia," because it was dedicated by the Lemnians. Pausanias says, "it deserves to be inspected above all the works of Phidias." As an example of one of the forms under which this goddess was represented in sculpture, we have engraved her bust from a copy in the Greek Court.*

Beyond the temple which contained the Minerva Lemnia stood a brazen Apollo, by Phidias. It was known as the "Apollo Par-nopius," so called because he banished locusts from the land. The last statue of Phidias to which we shall refer is that of Nemesis, in her temple at Rhamnus, which was about sixty stadii distant from Marathon. When the Persian invaders reached Marathon, they brought with them Parian marble, for the purpose of erecting a trophy, for they were confident of success. Out of that very stone Phidias made the statue which was dedicated to Nemesis, who, it was believed, had powerfully aided in the defeat of the barbarians. On the head of the goddess was a crown adorned with stags, and small images of Victory. In her left hand she held the branch of an ash-tree, and in her right a cup, in which the figures of Ethiopians were carved. This statue was without wings; but among the Smyrneans, who possessed the most holy images of Nemesis, they all had wings. "The Greeks report," observes Pausanias, "that Nemesis was the mother of Helen, but that Leda was her nurse; for all the Greeks are unanimous in asserting that Jupiter, not Tyndareus, was her father. Phidias, being well acquainted with these particulars, represented Helen led by Leda to Nemesis. He added also Tyndareus and his sons, and a man whom they called Hippea standing by a horse. Agamemnon, too, Menelaus, and Pyrrhus, the son of Achilles, are present, which last, first of all, espoused Hermione, the daughter of Helen; but Orestes is not introduced, on account of his impious conduct to his mother, though Hermione never deserted him, but even bore him a son."

SCOPAS.—Scopas, one of the most famous of the ancient statuary, erected an ivory figure of Venus, in her temple at Megara, which was called "Praxis," and, in the same place, a Love, an Imeros, and a Pothos. In the gymnasium, near the forum of Sicyonia, a stone statue of Hercules; at Argos, a statue of Hecate, placed in her temple; at Elis, a brazen statue of Venus, standing on a brazen goat, already noticed; at Gortys, a city of Arcadia, a statue of Æsculapius, without a beard, of Pentelican marble; and one of Hygeia. He built for the Tegeatæ a temple, dedicated to Minerva, on the site of an old one built by Aleus, but destroyed by fire; and, when Pausanias wrote, he tells us that it surpassed all the temples in Peloponnesus, both in its construction and magnitude. He thus describes it:—

"The first ornament of this temple is a triple series of columns, the first of which are of the Doric order, the second of the Corinthian, and the third without the temple are of the Ionic order. The architect of this temple is said to have been the Parian, Scopas, who made statues for many parts of ancient Greece about Ionia and Caria. On the front part of the roof the hunting of the Calydonian boar is represented. The boar occupies the middle part; and on one side Atalanta, Meleager, Theseus, Telamon, Peleus, Pollux, and Iolaus, who was the companion of Hercules in most of his labours, stand; and, besides these, the sons of Theseus, and the brothers of Althea, Prothous, and Cometes; but, on the other side, Ancæus is represented wounded, and lifting his axe, and Epochus supporting

him. Near him stand Castor, Amphiaraus, the son of Oicles, and Hippothous, the son of Cercyon, the grandson of Agamcles, and the great-grandson of Stymphalus. The last person that is represented is Pirithous. But in the back part of the roof, the single combat of Telephus and Achilles in the plains of Caius is represented."

When Augustus Cæsar conquered Antony and his allies, he carried away the ancient statue of "Minerva Alea," and the teeth of the Calydonian boar, and placed the Minerva in the entrance of the forum which he built, and which bore his name. It was entirely made of ivory, and was the work of Endius. The "Minerva Alea" which existed at Tegea in the time of Pausanias, was brought from a town of the Manthurienses, who worshipped the goddess Hippias, but nevertheless the Greeks called it "Minerva Alea." On one side of the statue stood Æsculapius, on the other Hygeia, both of which were of Pentelican stone, and the work of Scopas. Pausanias says that in his time was exhibited the skin of the Calydonian boar, rotten through length of time, and entirely bare of bristles; and such of the fetters as had been spared by time with which the Lacedæmonian captives were bound while they dug the plain of Tegea. The sacred bed of Minerva also remained.

PRAXITELES.—On advancing from the Piræus to the gates of Athens, the road was lined with the tombs of celebrated men. On one of those tombs Praxiteles sculptured the statue of a soldier standing by his horse, but the name of the warrior is unknown. On entering the city was a temple dedicated to Ceres, in which the statue of the goddess herself, of her daughter Proserpine, and of Iacchus holding a torch were contained. In the time of Pausanias, an inscription on the wall, in Attic letters, signified that all these were the work of Praxiteles. At Megara he executed a statue of "Diana the Saviour," so called from the following circumstance: after the army of Mardonius, the general of Xerxes, King of Persia, had invaded the Megaric land, his soldiers were desirous of returning to Thebes, where Mardonius himself was stationed; but the goddess Diana caused them to begin their march by night, and, in consequence of their losing their way, they bent their course to the mountainous part of the country, and thinking that their enemies were near them, shot their arrows at the neighbouring rock, which emitted a sound like that of groaning, but they, supposing that the noise was occasioned by the groans of wounded men, did not desist from shooting till their quivers were exhausted; but as soon as it was day, the armed Megarenses attacking the disarmed Persians, slew a great part of them, and, in memorial of this victory, made an image of "Diana the Saviour."

In the Temple of Bacchus at Megara, near the image of that god, Praxiteles executed a Satyr in Parian marble; and in a temple of Venus, next to that of Bacchus, a statue of the goddess of Persuasion, and another called the "Consolatrix." In an adjoining temple dedicated to Fortune, he made a figure of that fickle goddess. Also at Megara, in the Temple of Apollo Tutelar, he sculptured Apollo, Latona, and Diana. At Elis he executed a Mercury in stone, carrying an infant Bacchus; and also a full-grown Bacchus, dedicated to that god. The Eleans worshipped Bacchus above all the divinities, and asserted that he was always present at that festival of theirs which they called Thyia. On this temple of Bacchus Pausanias relates an amusing story of superstition. "In this temple the priests bring three empty kettles; citizens and strangers, if they should happen to be at Elis, being at the same time present. But afterwards the priests and others, to whom the care of the temple is committed, seal the doors. The next day they enter the temple, and though their seals have not been broken, they find the kettles filled with wine."

At Mantinea Praxiteles sculptured Latona and her children; at Platea he made a statue of Juno, called "Teleia" or the Perfect, and one of Rhea presenting Saturn with a stone wrapped in swaddling clothes, instead of the child of which she had been delivered. Both these were of Pentelican marble. For the Thebans he carved many of the labours of Hercules in a temple which they had dedicated to that demigod, under the name of "Hercules Promachos," or the Defender. Praxiteles carved the labours in the roof of this temple, omitting the birds called Stymphalides, and the purification of the Elean land; instead of these he represented the wrestling of Hercules with Antæus. To Phocæa he contributed a statue of Æsculapius, and to Anticyra one of Diana. Her temple was erected on a lofty rock, forming part of a mountain two stadii from Anticyra, and in that temple her statue was placed. She held a torch in her right hand, and a quiver depended from her shoulders. A hound stood at her

* See Engraving, p. 113.

left side. The height of the statue exceeded that of any woman, though not colossal. For the Thespians he made a statue of Venus and one of Phryne, the rich courtesan. At Delphi he made another statue of Phryne, of gold, which she herself dedicated, and a statue of Love. But what he most prided himself on was his Satyr, which stood at the Prytaneum, at Athens, and with this an amusing anecdote is connected. Phryne, with whom he was in love, once asked him which was the most beautiful of his works; this he refused to tell, but offered all his productions. Phryne, determined to gratify her curiosity, had recourse to stratagem. She desired her servant to go to Praxiteles and inform him that his workshop was on fire, and that a great part of his works were already destroyed, and the rest in imminent danger. On this information, Praxiteles hastily left his apartment, and declared that his affliction would be but trifling if the flames had spared his Satyr and Love. Phryne, on hearing this, bade him be of good courage, for no calamity had befallen him, confessing that she had contrived the stratagem to compel him to confess which was the most beautiful of his works. The statue of Love was made of Pentelican stone. It was first moved out the place where it was originally deposited by Caius Cæsar Caligula. It was afterwards sent back to the Thespians by the Emperor Claudius, and again brought to Rome by Nero, where it was destroyed by fire.

As we have mentioned Phryne, we may allude to the still more celebrated Aspasia,* a courtesan of Miletus, who settled at Athens. She was of admirable beauty, yet her wit and eloquence were still more remarkable, and won for her extraordinary reputation among all ranks in the republic. Her judgment was acute, her knowledge varied, and people of the first distinction of both sexes frequented her house as a school of instruction; even Socrates listened to her fascinating conversation, and she so captivated the celebrated Pericles that, notwithstanding her infamous life, he married her.

POLYCLETUS.—Polycletus, the Argive, was a famous statuary at Mycenæ, where stood a temple dedicated to Juno, and built by the Argive architect Eupolemus. Polycletus formed a statue of the goddess, seated on a throne of great magnitude, of ivory and gold. She had a crown on her head, on which the Graces and Hours were represented; in one hand she held a pomegranate, in the other a sceptre. A cuckoo was perched on the sceptre, the reason being that Jupiter, being enamoured with Juno when a virgin, changed himself into that bird, and Juno chased it in sport. The sculpture above the columns of this temple recorded the birth of Jupiter, the battle of the Gods and Giants, and the destruction of Troy. Before the entrance were statues of the women who had been priestesses of Juno. On the left hand of the vestibule were ancient statues of the Graces, and on the right hand the bed of Juno.

At Argos, Polycletus sculptured a statue of "Jupiter Milichius," or the Mild, from white stone. Pausanias assigns the following reason for its dedication. The Lacedæmonians having undertaken a war against the Argives, did not cease their hostilities till Philip, the son of Amyntas, compelled them to rest satisfied with the ancient boundaries of their kingdom. In former times, indeed, the Lacedæmonians did not meditate any conquests beyond Peloponnesus, but they were always taking away something from the dominion of the Argives; or else the Argives, when the Lacedæmonians were engaged in wars beyond their own boundaries, pressed on the Lacedæmonians. Both, therefore, having arrived at the extremity of hatred, the Argives thought proper to retain a thousand chosen men, appointing the Argive, Bryas, for their general. This man, among many injuries that he committed towards the people, seized on a virgin as she was going to be married, and then laid the blame of her capture on her attendants. The virgin, however, on the same night, blinded Bryas when he was asleep, and being seized as soon as it was day, she fled in a suppliant posture to the people, who would not suffer her to be punished by the thousand men. In consequence of this a battle ensuing, the people were victors, who, giving way to their wrath, did not leave one of their adversaries alive. But, afterwards, expiations of civil blood took place, and a statue of *Mild* Jupiter was dedicated.

On Mount Lyeone, near Tegea, in Arcadia, in the Temple of Diana Orthia, Polycletus carved that goddess, and Latona and Diana, out of white stone. At Epidaurus he proved his skill as an architect in constructing a theatre within a temple; and, in alluding to it, Pausanias exclaims, "What artist will take upon him to con-

tend with Polycletus?" At Amyclæ, in the territory of the Lacedæmonians, he made the Venus which was called the "Venus with Amyclæus." Amyclæ was famous for its tripods. Ten, the most ancient, were taken by the Lacedæmonians in the war which they waged against the Messenians. Under the first tripod the Venus stood; under the second that of Diana; under the third Proserpine. These three were larger than the ten taken from the Messenians, and were dedicated in honour of the great victory at Ægospotamos. At Megalopolis, Polycletus made a statue of Bacchus, which stood in the Temple of Jupiter Philius, or the Guardian of Friendship. This statue wore buskins instead of shoes; in one hand was a cup, in the other a thyrsus, and perched on the thyrsus was an eagle, rarely connected with Bacchus.

MYRON.—This Athenian sculptor executed a brazen statue of a boy named Lycius, holding a laver in his hand, and a "Perseus destroying Medusa," both placed in the tower of Athens. At Ægina he made a wooden statue of Hecate, whose mysteries the Æginetæ celebrated every year, for they revered her above all the other divinities. He also made an upright statue of Bacchus, which was dedicated by Sylla, who took it from the Orchomenian Minyæ; "and this," says Pausanias, "is what the Greeks call venerating a divine nature with foreign fumigations." The master-piece of Myron was his Erectheus, at Athens. Myron sculptured many of the victors in the Olympic games; among others Lycinus, who brought colts to Olympia, but not approving them, trained horses and won the prize; and Timanthes, whose death is worthy of notice. After he had withdrawn from athletic exercises on account of age, he used every day to bend a large bow for the purpose of making trial of his strength. Happening, however, to take a journey, he omitted this exercise during his absence from home, and on his return attempted to bend his bow as usual; finding that his strength had failed him, he raised a funeral pile, and threw himself into the fire.

CALAMIS.—This statuary executed a beardless Æsculapius of ivory and gold, which was placed in his temple at Sicyonia. In one of his hands he held a sceptre, and in the other the fruit of a pine-tree. The brazen boys at Olympia extending their right hands in the attitude of prayer to Jupiter were his work, and also a statue without wings, in imitation of an ancient one at Athens, called "Apteros;" a statue of Ammon in his temple at Thebes; a Triton in the Temple of Bacchus at Tanagra, of Parian stone, of which Pausanias narrates the following story. The Tanagrian women, who were first initiated into the orgies of Bacchus, went down to the sea for the sake of purification. While they were swimming in it, they were assaulted by Triton; and on their imploring Bacchus to defend them, the god heard their prayer, attacked and vanquished Triton. There is another report, which is not so venerable, but more probable. It is this: whatever cattle were driven to the sea were seized and carried away by Triton, who used likewise to seize all small vessels, till the Tanagrians placed on the shore bowls of wine; for Triton, allured by the fragrance, found and drank the wine, was overpowered by sleep, and fell headlong from a steep part of the coast on to the beach. A Tanagrian then cut off his head with an axe, and that is the reason why his statue was headless. The following is the description of a triton. The hair of the head resembles the parsley which grows in marshes, both in its colour, and in the perfect similitude of one hair to another, so that you cannot distinguish any difference between them. The rest of the body is rough with small scales, and is of the same hardness as the skin of a fish. They have the gills of a fish under their ears. Their nostrils are those of a man, but their teeth are broader than those of the human species, and like the teeth of a wild beast; their eyes are azure, and their hands, fingers, and nails, are of the same form with the upper shells of shell-fish. They have fins under the breast and belly, like those of the dolphin, instead of feet.

At Tanagra there were two temples dedicated to Mercury, one of which was called the Temple of Criophoros, which means the "Bearer of the Ram," and the other of Promachos, or the Defender. The former of these was thus denominated because Mercury dispersed a pestilence raging at Tanagra by carrying a ram round the walls. To commemorate that event Calamis made here a statue carrying a ram on his shoulders. At the festival of Mercury the most beautiful of the Tanagrian youth carried a ram on his shoulders round the walls. He was called Promachos because he aided the Tanagrians when they were invaded by the Eretrians,

* See Engraving, p. 113.

from Eubœa, armed with a currycomb, with which he put the enemy to flight.

GLAUCUS.—Glaucus, the Chian sculptor, is worthy of notice as the first among the Greeks who discovered the art of soldering iron. He made the iron basis of the bowl of Alyattes, the Lydian king, who presented the famous bowl to Apollo preserved at Delphi. In that basis there were neither clasps nor nails, but only solder. Its form was that of a tower, and rose from an acute bottom to a broad top. It was begirt with transverse zones of iron like the steps in a ladder. Straight and ductile laminæ of iron were bent in their extremities outwards, and formed the seat of the bowl. The centre or navel was formed of a white stone, to represent the middle point

strenuously held, that, notwithstanding the leaping and struggling of the ox to get free, the animal only escaped with the loss of its hoof. Polydamas was able to stop a chariot when it was driven along rapidly by a charioteer, merely seizing it behind with one of his hands. His fame spread to Persia, and Darius Nothus invited him to Susa. On arriving there, he slew three of the soldiers of that picked band who were called Immortals, though they attacked him simultaneously. All these exploits were recorded on the base of his statue at Olympia or in the inscriptions. His death arose from too much confidence in his strength. Entering a cavern to sleep during the heat of the day with some of his companions, some fissures were seen at the top: this indicating danger, the



FRIEZE OF THE PARTHENON.

of the earth. At Olympia, Glaucus made several statues, Amphitrite, Neptune, and Vesta.

LYSIPPUS.—Lysippus, the Sicyonian, was one of the most eminent artists of his day. In the forum of Corinth he made a brazen Jupiter,

friends left, but Polydamas was determined to stay, and extended his hands to support the sinking roof. His efforts were vain, and he was buried in the ruins of the mountain. Lysippus also made the statue of Jupiter Nemeus, at Nemea, of brass, near to a temple



FRIEZE OF THE PARTHENON.

and in the Temple of Apollo Lyceus, a brazen Hercules, which stood near the forum. At Elis, a statue of Pyrrhus, who was victorious in the horse race. On that occasion he was judge of the games, but from that time the Eleans made a law that no judge of the games should be at the same time a competitor. The statue of Chilon was also made by Lysippus. This man was twice victorious in wrestling in the Olympic games, once at Delphi, four times in the Isthmian, and thrice in the Nemeæan games. He died in battle, and was buried by the Achæians as a mark of honour. All these particulars were inscribed on the base of his statue at Olympia. Lysippus also made the statue of Polydamas, a man of gigantic stature, whose adventures, narrated by Pausanias, are very curious, for he acquired renown not only as a wrestler, but in other efforts of strength.

The mountainous part of Thrace, within the river Nestus, which flowed through the country of the Abderites, was infested with wild beasts. The camels which carried the provisions of the army of Xerxes suffered greatly through the attacks of lions, which often wandered into that part of the country that encircles Mount Athos. In this mountain Polydamas, perfectly unarmed, slew a large and strong lion, eager to emulate the exploits of Hercules. On another occasion he met a herd of oxen, and seized the largest and fiercest ox among them by one of its hind feet: this he so

of Fortune, to which Palamedes dedicated the dice which he had invented.

ALCAMENES.—This artist, in the judgment of Pausanias, was only inferior to Phidias. When Mardonius, the Persian general,

burnt the Temple of Juno, at Athens, the statue of the goddess escaped injury. It was the work of Alcamenes. He also made a statue of Mars, in the temple of that god, at Athens; and, according to Pausanias, one of Hecate for the Athenians, with three bodies joined in one, which the Athenians call Epipyrgidia, and which stood near the Temple of winged Victory. This triple form symbolised the moon under three aspects, as Diana



SCULPTURES OF THE PARTHENON.

in the sky, as Trivia on earth, as Hecate below the horizon. At the Temple of Jupiter Olympius, at Elis, Alcamenes executed all the work at the back part of that building, already described when mentioning the works of Phidias. At Mantinea the same artist made a statue of Æsculapius, in the Temple of Hercules Promachos, and at Thebes, two colossal statues of Minerva and Hercules in Pentelican stone.

Having now noticed the most celebrated sculptors who flourished from the time of Pericles to that of Alexander the Great, or from the epoch of Phidias to the epoch which terminates with Praxiteles, we turn to the sculptured decorations of the Parthenon. These represent the ceremonies observed at the festival of Minerva, the







HERCULES AND THE LION
By the same Sculptor as the preceding

Panatheanic procession, and some of the leading historical facts or traditions connected with the exploits of the ancient or fabulous heroes of Athens. Ingenious and learned men have attempted an accurate interpretation of these sculptures, but, imperfect and mutilated as they are, so much is left to conjecture, that anything approaching to a complete enumeration is impossible; so that what one critic advances as true, his successor denies. We know this festival was celebrated once in five years, and every free-born inhabitant of Attica had a right to attend the ceremony. The reigning archon and a priestess presided, and the most solemn act was a presentation of a new veil to cover the statue of the tutelary

goddess. Among the most interesting remains of Greek art discovered in 1823 by Messrs. Angell and Harris, two English architects, are the Selinuntine marbles. Selinus, a city in Sicily, was founded by the Megarenses about 750 B.C. It stood near mount Etna, and rose to such prosperity that it yielded in opulence and power to none of the Sicilian cities, except Syracuse and Agrigentum. But towards the end of the fifth century B.C., it was destroyed by the Carthaginians, to whom it then became subject. By the conquerors it was partially restored, and existed for a century and a half longer, at the end of which period it was ruined in the wars between the Carthaginians and Romans, and its ruins have strewn the site on



SCULPTURE OF THE PARTHENON.

goddess. It may be well to observe that there were the greater and lesser Panathenæa. The latter originated with Theseus, and were celebrated every year in the month Hecatombeon. In the former old men, selected for their good appearance, carried branches of olives. Races were held with torches, both horse and foot races; there was also a trial of skill in music. The conqueror in any of these games was rewarded with a vessel of oil, for the olive was the gift of Minerva. Boys danced in armour. The sacred vest, carried in the procession, was worn by persons of all ages. Herodotus says (*Melpomene*, cxxxix.):—"From the Libyans the Greeks borrowed the vest and the ægis with which they decorate the

which it was erected for twenty-two centuries. There have been various interpretations of the Selinuntine sculptures by modern critics, but Pausanias states that before the Carthaginians drove the Selinuntii from their residence in Sicily they had dedicated a treasury to Olympian Jupiter, in which there was a Bacchus,



SCULPTURE OF THE PARTHENON.

shrine of Minerva; the vests, however, of the Libyan Minerva are made of skin, and the fringe hanging from the ægis is not composed of serpents, but of leather; in every other respect the dress is the same; it appears by the very name, that the robe of the statues of Minerva was borrowed from Libya. The women of this country wear below their garments goat-skins, with the hair fringed and stained of a red colour, from which part of the dress the word *ægis* of the Greeks is unquestionably derived. I am also inclined to believe that the loud cries which are uttered in the temples of that goddess, have the same origin; the Libyan women do this very much, but not disagreeably."



SCULPTURE OF THE PARTHENON.

whose face, feet, and hands were made of ivory; and that in the treasury of the Metapontines, which was next to that of the Selinuntii, there was a statue of Endymion, all the parts of which, except the drapery, were made of ivory. He states that he is ignorant of the cause of the destruction of the Metapontines, and that in his time nothing remained but a theatre and the enclosure of the walls. Messrs. Angell and Harris discovered the ruins of six temples. Mr. Angell observes, "for the gradual erection of the temples we have a period of about two hundred and forty-five years; and assuming, not without strong grounds, the central temple on the western hill to have been the first erected after the

foundation of the colony, established by concurring testimony about the 32nd Olympiad, or six hundred and fifty years B.C.; we may safely place its sculptures at more than half a century prior to the assigned date of the Theseum."

Sicily, once one of the most flourishing of the Greek colonies, was adorned with the most magnificent temples. When Brydone visited the island, in 1770, he observed, near the ruins of the ancient city of Agrigentum, four temples, one of which, dedicated to Concord, was entire, not one column having fallen. Next to it was a temple sacred to Venus, of which one half was in a good state of preservation. The third temple was that of Hercules, altogether in ruins. It was here that the famous statue of the demi-god stood, celebrated by Cicero, and which the people of Agrigentum defended with so much bravery against Verres, who attempted to seize it. There was likewise in this temple a famous painting of Xeuxis. It represented Hercules in his cradle killing the two serpents. Almena and Amphitryon, having just entered the apartment, were painted with every mark of astonishment and terror. Pliny says that Xeuxis regarded this painting as invaluable, and therefore never could be induced to put a price upon it. He made a present of it to the people of Agrigentum, to be placed in the Temple of Hercules.

The fourth temple was dedicated to Jupiter Olympius, supposed by Sicilian authors to have been the largest heathen temple in the world. It is said to have stood till the year 1100, but is now a perfect ruin. The remains of some smaller temples exist, as those of Vulcan, Proserpine, Castor, and Pollux, and a very remarkable one of Juno, enriched by one of the most famous pictures of antiquity. Xeuxis was determined to paint a model of human perfection, and prevailed on all the finest women of Agrigentum to appear naked before him. Of these he chose five, and moulding all their beauties into one, composed his picture of the goddess. It was considered his masterpiece, but was burnt when the Carthaginians captured Agrigentum.

The ruins of the Temple of Æsculapius were to be seen when Brydone visited the island. It was celebrated for a statue of Apollo which it contained, which was taken from the Agrigentines at the same time that the Temple of Juno was destroyed. After the conquest of Carthage, it was restored by Scipio to Agrigentum. Some of the Sicilian antiquaries affirm that it was afterwards taken to Rome, and that it is in reality the statue known as the Apollo Belvedere.* Pausanias says, "The Sicilian nations are as follows:—The Sicani, Siculi, and Phrygians, the two first of which came thither from Italy, but the Phrygians from Scamander and Troy. The Phœnicians and Libyans, joining in one common military expedition, came into the island and founded colonies of Carthaginians. And such are the barbarous nations which inhabit Sicily;" but of the Greeks, the Dorienses, and Ionians, the Phœnices, and no great part of those that bear an Attic name, Mr. Brydone gives a much more interesting account. "Most of the Sicilian authors," says that learned traveller, "agree in deriving the origin of the Sicilians from Ham, or, as they call him, Cham, the son of Noah, who they pretend is the same as Saturn. They tell you that he built a great city, which, from him, was called Camisena. This same Cham they tell you was a very great scoundrel, and that Esemus, which signified *infamous*, was added to his name only to denote his character. Fazzello says he married his own sister, who was called Rhæa; that Ceres was the fruit of this marriage; that she did not inherit the vices of her father, but reigned over Sicily with great wisdom and moderation; that she taught her subjects the method of making bread and wine, the materials of which the island produced spontaneously and in abundance. Her daughter Proserpine was of equal beauty and virtue as herself. Orius, King of Epirus, demanded her in marriage, and, on a refusal, carried her off by force. This gave rise to the fable of the rape of Proserpine by Pluto, Orius being of a morose and gloomy disposition. Ceres, before the introduction of Christianity, was the favourite deity of the Sicilians. She chose her seat of empire in the centre of the island, on the top of a high hill called Enna, where she founded the city of that name. Milton alludes to this tradition—

* Not that fair field
Of Enna, where Proserpine, gathering flowers,
Herself a fairer flower, by gloomy Dis
Was gathered."

* See Engraving, p. 120.

Cicero gives a particular account of this place. He says, from its situation in the centre of the island, it was called 'Umbilicus Siciliae,' and describes it as one of the most beautiful and fertile spots on the earth. The Temple of Ceres, at Enna, was renowned all over the heathen world, and attracted numerous pilgrims."

That huge cavern cut out of the solid rock in the form of the human ear, and called the "Ear of Dionysius," at Syracuse, was one of the most remarkable monuments of Sicilian art. The perpendicular of it measured 80, and the length 250 feet. The cavern was so contrived that every sound made in it was collected into one point, as into a focus, which was called the Tympanum; exactly opposite to it Dionysius had made a small hole, which communicated with a little apartment where he used to conceal himself. To this hole he applied his ear, and is said to have heard distinctly every word that was spoken in the cavern below. The work was no sooner completed and found to answer the purpose for which it was designed, than the tyrant put to death all the workmen employed in its construction. He then confined in it all whom he suspected of being hostile to his government, and by over-hearing their conversation judged of their guilt or innocence. The holes in the rock to which the prisoners were chained, and even the lead and iron in several of them, were seen by Mr. Brydone about the year 1770.

The fountain of Arethusa is one of the curiosities of Sicily. It was sacred to Diana, who had a magnificent temple in the neighbourhood. Arethusa, a huntress, was enamoured of the hunter Alpheus, but from caprice refused to marry him, and fled, as Pausanias says, to an island called Ortygia, near Syracuse, where she was changed into a fountain, and Alpheus into a river. Pausanias continues thus:—"There is no reason why we should disbelieve that this river, passing through the sea, is mingled with the fountain at Syracuse, since this is asserted by the Delphic Apollo; for when the god ordered Archias the Corinthian to establish a colony in Syracuse, he thus speaks, 'a certain island called Ortygia is situated in the dark sea above Trinacria, where the mouth of Alpheus pours its streams, and mingles itself with the fountains of Arethusa, which sends forth refreshing gales.'" The ancient historians, philosophers, and poets, believed that a golden cup won at the Olympic games, and which was thrown into the Grecian Arethusa, was soon afterwards cast up by the Sicilian one; and that after the great sacrifices at Olympia, the blood of which fell into that river, the fountain of Arethusa rose for several days tinged with blood. The myth is that the nymph Arethusa was transformed into a river by Diana, who conducted her by subterranean passages from Greece to Sicily to avoid the pursuit of Alpheus, who was also changed into a river.

The figure in the Crystal Palace called the "Seythian Grinder," has also been named the Remouleur, and Arrotino. It represents a man kneeling and whetting a knife. It is an admirable statue, and the attitude and expression denote a suspension of labour, and act of listening. Some antiquaries have supposed that it represents a slave overhearing the conspiracy of Catiline; others, the conspiracy of the sons of Brutus. The artist is unknown. The general opinion, however, is, that the man is sharpening his knife to slay Marsyas, who had been vanquished by Apollo in a musical contest. The fable relates that Marsyas challenged Apollo to a trial of skill, that he was defeated, and that Apollo flayed him alive for his presumption, or ordered him to be flayed; and Herodotus says that his skin was suspended in the forum of the city of Celæne (*Polyhymnia*, c. xxvii.) The punishment of Marsyas is an allegory. Before the invention of the lyre, the flute was the first of all musical instruments; after the introduction of the lyre the flute fell into disrepute, and nothing was to be gained by excelling on it. Pausanias describing one of the pictures of Polygnotus, in Phocis, says that in one of the temples at Delphi was a picture which contained, amongst other figures, Marsyas sitting upon a rock, and the youth Olympus by him, who seems to be learning to play on the flute. Amongst the Phrygians who inhabited Celæne was a tradition that the river which ran through their country was once this very Marsyas: that he invented that melody of the pipe which the Greeks call *Metroos*, or harmony sacred to the mother of the gods, and that he assisted them when they were attacked by the Gauls, both by means of the water of the river Marsyas, and the melody of his pipes.

From the statues of learned men in the Greek Court, we engrave the head of Aristotle. His writings are too well known to require any comment, but the cause of his suicide may be briefly stated.

The very narrow strait which runs between Boeotia and Eubœa was called Euripus, where the sea was said by the ancients to ebb and flow seven times in a day. Aristotle endeavoured to solve this problem and explain the phenomena, but failed, and through vexation put himself to death.



BUST OF ARISTOTLE.

The Choragic monument of Lysicrates, at Athens, was a cylindrical building about seven feet in diameter, with a circular range of columns supporting an entablature. As this kind of monument is connected with theatres and the drama, we shall make a few remarks on those subjects. The primitive drama was legendary, narrating fables connected with the birth and adventures of Dionysus. The reciter of these narratives was habited in goat-skins, probably representing a satyr, one of the constant attendants of Dionysus. Hence this kind of exhibition was called *Tragœde*, for the Greek word for tragedy is *goat-ode*; while comedy, on a similar principle, was called the ode of the revellers. In a later period all honour was not paid to Dionysus; other gods and heroes, and their adventures, were brought upon the stage. In the age of Thespis satyrs were banished from the theatre. The performer wore a mask and an appropriate costume. Thespis made many other improvements, and is properly considered the inventor of the dramatic form of tragedy. No changes were made from the time of Thespis to the time of Phrynichus, who flourished B.C. 511, and it was he who broke through the old rule, which confined the drama to the exploits of Dionysus. Suidas says that Phrynichus wrote ten tragedies, and to him is ascribed the introduction of female characters. Herodotus informs us that "on seeing the capture of Miletus represented in a dramatic piece by Phrynichus, the whole audience burst into tears. The poet, for thus reminding them of their domestic calamities, was fined a thousand drachmæ, and the piece was forbidden to be repeated."

In the year B.C. 523, Chœrilus perfected and refined the satiric drama. Some, however, contend that Pratinas completed what Chœrilus only commenced. The first dramatic contest of Æschylus, in which he contended against Chœrilus and Pratinas took place B.C. 499. Æschylus was born B.C. 525, and fought at Marathon. He is said to have composed seventy tragedies in forty-four years, of which only seven have descended to us. He says that when he was a boy he once fell asleep in a field, where he was watching some grapes, and that Bacchus appeared to him in a dream, and exhorted him to write tragedies. Pausanias says that he was the first who represented the Furies with snakes in their hair, for neither the statues of these goddesses nor any other of the subterranean deities are in the least dreadful in their appearance. Being exiled, he took refuge at the court of Hiero of Syracuse, and in the sixty-ninth year of his age was killed by an eagle letting fall a tortoise on his bald head; an oracle had foretold that he would die by a stroke from heaven, and the prediction was fulfilled in the singular manner related.

The date of the birth of Sophocles is usually fixed B.C. 495, thirty years subsequent to that of Æschylus. He was the son of Sophilus,

a smith, or sword-cutter. On exhibiting his play, called *Triptolemus*, now lost, he competed against Æschylus, and was victorious at the age of twenty-seven. After a silence of twenty-seven years, he produced *Antigone*, the most beautiful of all his dramas. He wrote one hundred and thirteen plays, but only seven remain.

Euripides was born B.C. 480, on the same day that the battle of Salamis was fought. In early life he was a painter. The number of his dramas is variously stated at seventy-five and ninety-two, of which only eighteen survive. He died at seventy-five years of age. Theopompus says that the mother of Euripides gained a livelihood by selling vegetables, and that his father, when Euripides was born, was told by the Chaldeans that his child would be conqueror in the public games. The father, interpreting the boy's fate literally, thought he might make him a wrestler. In the Eleusinean and Thesean games he was victorious. Having strengthened his body, he applied himself to the culture of his mind, and studied under Anaxagoras the physician, Prodicus the rhetorician, while Socrates instructed him in moral philosophy. At eighteen years of age he began to write tragedy. Philochorus relates that in the island of Salamis was a wild gloomy cave, wherein Euripides often laboured at his dramas. He is said to have held all women in particular abhorrence, either from a natural dislike to their company, or because he had at the same time two wives. When Euripides was in Macedonia with King Archelaus, that monarch admitted him to his intimacy; but, returning one night from visiting the king, he was torn by dogs set on him by a rival, and died of his wounds. The Macedonians treated his memory and his tomb with great respect, proud that so eminent a poet had been buried in their country; so that when ambassadors were sent to them by the Athenians, requesting that his bones might be sent back to Athens, his native land, the Macedonians unanimously persisted in denying the request. Such is the account given by Aulus Gellius, but Suidas denies its truth, and asserts, on the authority of Philochorus, that the mother of Euripides was of a very noble family. Valerius Maximus so far contradicts Suidas as to affirm that the tale of the low descent of Euripides was believed by almost all learned men. The incident of the poet's death is related by Suidas: his assailant was some courtier, who suspected that he had done him ill offices with the king, their common master. Writers, however, are by no means agreed as to the manner of his death. Some simply say that he died in Macedonia, others that he was torn in pieces by women. The Athenians, not being able to recover his bones, erected a statue to his honour. In the Crystal Palace are statues of the three great dramatists—Æschylus, Sophocles, Euripides.

It was the custom for wealthy individuals to give gratuitously musical and theatrical entertainments; he who did so was called *choragus*, and the monuments erected to commemorate his liberality were called *choragia*. Some have called the monument raised in honour of Lysicrates the "Lantern of Demosthenes;" but the inscription on the frieze not only contains the name of Lysicrates, but designates him as *choragus*.

Another remarkable object in the Greek Court is the bas-relief representing the "Battle of the Amazons." This event is commemorated on the four sides of a sarcophagus. It is said to have been brought from Lacedæmon by Don John of Austria, natural son of Charles V., after his signal victory over the Turks, at Lepanto. Speaking of the Sauromatæ, who were also called Sarmatæ, or Sarmatians, Herodotus (*Melpomene*, c. cx.), gives the following account of the Amazons:—"In a contest which the Greeks had with the Amazons, whom the Scythians call *Oiorpata*, or, as it may be interpreted, men-slayers (for *oior* signifies a man, and *pata*, to kill), they obtained a victory over them at Thermodon. On their return, as many Amazons as they were enabled to make captive they distributed in three vessels; these, when they were out at sea, rose against their conquerors, and put them all to death; but as they were totally ignorant of navigation, and knew nothing at all of the management of either helms, sails, or oars, they were obliged to resign themselves to the winds and the tide, which carried them to Chremnes, near the Palus Mœotis, a place inhabited by the free Scythians. The Amazons here disembarked, and advanced towards the part which was inhabited; and meeting with a stud of horses on their route, they immediately seized them, and, mounted on these, proceeded to plunder the Scythians. The Scythians were unable to explain what had happened, being neither acquainted with the language, dress, nor the country of the invaders. Under

the impression that they were a body of men nearly of the same age as themselves, they offered them battle. The result was that, having taken some prisoners, they discovered them to be women." The Scythians then adopted a pacific stratagem, which resulted in the marriage of the two sexes; but the Scythians did not return to their country, for, in the words of Herodotus, the Amazons addressed them in the following terms:—"We cannot associate with your females, whose manners are so different from our own; we are expert in the use of the javelin and the bow, and accustomed to ride on horseback, but we are ignorant of all feminine employments; your women are very differently accomplished—instructed in female arts, they pass their time in their waggons, and despise the chase with all similar exercises; we cannot therefore live with them. If you really desire to retain us as your wives, and to behave yourselves honestly towards us, return to your parents, dispose of your property, and afterwards come back to us, and we will live together at a distance from your other connexions." The young men approved of this advice; they accordingly took their share of the property which belonged to them, and returned to the Amazons, by whom they were thus addressed:—"Our residence here causes us much terror and uneasiness; we have not only deprived you of your parents, but have greatly wasted your country. As you think us worthy of being your wives, let us leave this place, and dwell beyond the Tanais." With this the young Scythians complied, and, having passed the Tanais, marched forward a three days' journey towards the east, and three more, from the Palus Mæotis, towards the north. Here they fixed themselves, and now remain."

This fancied community of women has given rise to much curious speculation. Penthesilea and Camilla are well known to the readers of *Homer* and *Virgil* as famous female warriors; and, indeed, among barbarous tribes women constantly fought by the side of their husbands; but that an exclusive community could ever have existed is almost impossible. Justin describes the Amazons as a colony of exiled Scythians, established on the coast of the Euxine, in Cappadocia, near the river Thermodon; and as they were very troublesome, a force was sent against them, by which all the men were massacred. This accounts for a community of widows and spinsters; but, as Major Rennell asks, in his geographical work on Herodotus, how could it be perpetuated? However, in another passage (*Calliope*), Herodotus makes the Athenian deputies state, when demanding to lead one of the right wings of the Grecian army that fought at Platea against the rival pretensions of the Tegeans, who had claimed that post of honour, that their ancestors had repulsed the Amazons, who had advanced from the river Thermodon to invade Attica. The learned Bryant says, in his mythology, that the Amazons killed every man with whom they had connection.

The "Marriage of Peleus and Thetis" is described on a marble sarcophagus. Fable relates that Jupiter was enamoured of the sea-goddess Thetis, but an oracle having declared that she would be the mother of a son greater than his father, he desisted from his suit. It was thereupon determined that she should marry a mortal,

and Peleus was selected. From this union sprang Achilles. This story is connected with another, involving the fall of Troy. All the immortals were invited to this marriage excepting Eris, the goddess of Strife, who, irritated at her exclusion, threw a golden apple among the guests, with an inscription on it, directing it to be given to the most beautiful person in the company. Juno, Minerva, and Venus each claimed the prize; and Paris, one of the sons of Priam, who was then tending sheep on Mount Ida, was appointed umpire by Jupiter. Mercury conducted the three goddesses to the shepherd prince, each of whom offered him a bribe in their desire to possess the golden apple:—Juno offered him a mighty kingdom; Minerva wisdom; and Venus the most beautiful woman in the world for his wife. He awarded the prize to Venus, and subsequently carried off Helen, the wife of Menelaus, King of Sparta. These are the principal subjects delineated on the sarcophagus; but

in addition to them are figures of the four seasons—Winter, Spring, Summer, and Autumn.

The "Perseus and Andromeda" is in alto-relievo, and illustrates another of the beautiful fictions of antiquity. Andromeda was the daughter of Cepheus and Cassiopeia; and her mother boasted that she surpassed the Nereids in beauty. Neptune, indignant at this insult offered to the fair sex of his watery dominions, devastated the country by a huge marine monster; and the oracle declared that the offence of the mother could only be expiated by surrendering the daughter to this brute. She was accordingly chained to a rock, but Perseus, the son of Jupiter and Danae, slew the monster, and married Andromeda. It had been foretold that Danae's son would kill his grandfather, Acrisius, who locked his daughter up in a brazen tower, into which Jupiter descended in the form of a golden shower. This fable is the subject of Horace's well-known ode.* The prediction of the oracle was confirmed in a singular manner:—Perseus invented the quoit, and was fond of displaying his skill with it on every occasion. He went to Larissa, and there indulging in this amusement, accidentally killed his grandfather, "whose evil demon," says Pausanias, "brought him just then unperceived in his way."

The characters of alphabetical writing underwent many

changes in Greece, and the antiquarian derives great assistance from this fact in determining the age of a monument. Pausanias alludes to an old style of writing preserved on the chest of Cypselus, which his posterity dedicated in Olympia. He says the inscriptions on the chest "are for the most part written in ancient characters; and of these characters some are straight, but others are in that shape which the Greeks called *boustrophedon*, from the bending of oxen when ploughing; but they are bent as follows—from the end of one verse another follows in a retrograde order, just as in the course of the repeated stadium. There are, likewise, other inscriptions on the same chest, which are written in winding characters, difficult to be understood." At the Louvre, in Paris, is an ancient sculpture taken from a temple at Ægina, on which are

* "Inclusam Danaen turris ahenae," &c.



APOLLO BELVEDERE.

inscribed the names of Agamemnon, Talthybius, and Epeus, written in a somewhat circular form, which style leads to an approximate period for their antiquity.

What is called the Æginetan age runs from 490 to 466 B.C. "The Æginetæ," writes Pausanias, "inhabit that island which is opposite to Epidauria. They report that this island was not at first immediately inhabited, but that while it was yet a solitary place, Ægina, the daughter of Asopus, was brought into it by Jupiter, and that it was denominated from her, as prior to this it was called Ænone. As soon, however, as Æacus arrived at years of maturity, he requested Jupiter to furnish the island with inhabitants; and Jupiter, in compliance with his request, caused men to rise out of the earth, in order to people the island." Such is the fabulous origin of Ægina. While Æacus lived, Greece was afflicted with a dryness in the soil, arising from

of Panhellenian Jupiter was a temple of Aphaea, who was the same as the Dictymne of the Cretans. The temple of Panhellenian Jupiter is supposed to have been dedicated by Æacus. In Ægina were also the statues of Auxesia and Lamia, to which Pausanias offered sacrifice; and he says that the form of sacrifice was the same as at Eleusis. The fact is that Auxesia and Lamia were identical with Ceres and Proserpine, revered at the Eleusinian mysteries. Herodotus calls them Damia and Auxesia, goddesses who imparted fertility to the soil. These statues once belonged to the Epidaurians, and were formed of the wood of the garden olive, which they had obtained from the Athenians, but when the Æginetæ conquered the Epidaurians, they removed those statues to a place called Cea, in the centre of their territory.

Pausanias expressly declares that "the mountain Panhellenius contains nothing, except the Temple of Jupiter, which is worthy of



TEMPLE OF MINERVA, ÆGINA.

excessive heat, which destroyed all vegetation. The oracle at Delphi was consulted, and the Pythian directed that Jupiter would be propitiated through the intercession of Æacus. In consequence, all the cities of Greece sent deputies to Æacus, imploring him to act as mediator, who sacrificed and prayed to Panhellenian Jupiter, and rain immediately fell. To commemorate this event, the statues of the ambassadors were erected in the most conspicuous part of the city, in an inclosure called the Æaceum, which Pausanias describes as a square built of white stone.

It has already been observed that the deity most revered by the Æginetæ was Hecate, whose mysteries were celebrated every year. Pausanias also mentions temples dedicated to Apollo, to Diana, and to Bacchus. In the first was a naked wooden statue of the god, but those of Bacchus and Diana were clothed. The Bacchus had a beard. The statue of Æsculapius is also mentioned, which was of stone, in a sitting posture. On the road leading to the hill

description;" but in 1811, an important discovery was made by Mr. Cockerell, at Ægina, who met there, during an artistic tour, Baron Haller and other German gentlemen, well versed in the productions of antiquity. They investigated the ruins of Panhellenium, and lighted on the Temple of Minerva, the remains of which we have engraved. It may here be observed that the Selinuntine sculptures, to which we have already referred, relate to the metopes only, while the Æginetan relate to the pediments only. Eleven figures form a group in the pediment at the west end of the Temple of Minerva; at the eastern end, only five sculptured figures were found. These are supposed by some critics to represent two periods in a contest between the Greeks and Trojans for the body of Patroclus, slain by Hector. The figure of Minerva dominates over all. Other critics refer these groups to other historical events, but it is unprofitable to multiply conjectures where every hypothesis may be rendered more or less plausible.

THE MEDIEVAL COURT.

THE early Christians, fearful of persecution, worshipped in the old quarries or catacombs of Rome, where also they buried their dead. In later times, they built churches over these places, which were deemed sacred, as containing the ashes of saints and martyrs. These subterranean vaults in process of time became chapels, and church architecture, from these circumstances, embraced as one of its distinguishing features what are known as "crypts."

Constantine founded several churches at Rome, Byzantium, and other places, which were constructed on the model of the Roman basilica, of which there were nineteen at Rome, used as courts of justice or exchanges for merchants. In the fifth century, the Roman style of building was imitated in Gaul. Gregory of Tours relates that, in the reign of Childeric, Perpetuus, Bishop of Tours, built a new church over the tomb of St. Martin, having pulled down the old one, which was small and unworthy of the dignity of the saint. It was 155 feet in length, 60 in breadth, and 45 in height. In the whole edifice there were fifty-two windows, 120 columns, and eight doors, three in the sanctuary, and five in the body of the church.

The next historical epoch ranges from Clovis to Charlemagne. Clovis founded the abbey of St. Peter and St. Paul (now St. Genevieve) without the walls of Paris, which he began to build A.D. 507; the church and abbey of St. Peter, at Chartres; that of St. Mesmin, at Orleans, and some others of inferior size. His son Childebert built, in the neighbourhood of Paris, the church and abbey of St. Vincent, afterwards called St. Germain des Prés; while his brother Clotaire began the Church of St. Medard, at Soissons, which was finished by his son Sigebert. The churches of this period in France, though small in size, were solid in construction, and continued to exhibit the form of the Roman churches of the age of Constantine and his more immediate successors. Their characteristic features are thus described by the Rev. G. D. Whittington, in his *Historical Survey of the Ecclesiastical Antiquities of France*:—"Their shape was oblong, with a semicircular termination at the western extremity; and occasionally, but rarely, it assumed the figure of a cross. The roof was supported by internal porticoes of stone and marble columns, and externally covered with lead, or, in some instances with gilt tiles. The sanctuary and the coved ceiling of the apsis were encrusted with marble and mosaic-work, and a similar decoration was sometimes given to the western front. The walls were not unfrequently embellished, and the sculptures relieved by painting; the windows, which were often glazed, were narrow and round-headed, like those of the contemporary churches of Italy; and the pediment of the western front was generally perforated with a circular aperture or simple ornament, which was afterwards expanded into the beautiful rose windows so much admired in the cathedrals of later times."

It is doubted whether professed architects existed in those times. Abbots frequently drew a plan, and the clergy executed the mosaics, carving, smelting, and painting. Felibien, who wrote a biographical and critical work on the most celebrated architects, says that "in France at this period there were no artists superior to common masons, who knew little more than to mix the mortar and prepare the materials." During the seventh century, architecture continued to improve. Under Clotaire II., in the year 613, the divided sovereignties of France were again united, the result of which was internal tranquillity favourable to the arts. This was the epoch at which St. Eloy rose into notice. In the reigns of Dagobert and Clovis II., he had pursued the calling of a goldsmith and architect, but Clotaire III., made him bishop of Noyon. St. Eloy understood the arts of construction very well for the age in which he lived, planning several churches, nunneries, and monasteries; but he is chiefly celebrated for the magnificent shrines of gold, silver, and precious stones which he created after receiving the mitre. The shrines most noted are those of St. Denis, at Paris, and of St. Martin, of Tours. He died in the year 663. The Church of St. Denis was built by Dagobert.

The Abbey-Church, or Cathedral of St. Denis, which subsequently became the burial-place of the Bourbon kings of France, was commenced by Pepin, and completed by his son Charlemagne in 775. It is thus described by the Rev. Mr. Whittington:—"It is built in a strong, but heavy manner, and with great neatness of execution; a capital, however, of one of the columns should be noticed, as it

affords an illustration of the architecture of the times. This piece of sculpture exhibits the section of a church in which a priest, assisted by some others, is performing his devotions before an altar, which is covered with cloth. It is divided by a range of columns which support round arches. The artist has contrived in the same piece to show the west front of the building, which is flanked by two towers a little higher than the church, full of small round-headed windows, like the Lombard towers of Rome, and finished, like them, with low roofs. The space between the towers is occupied by another window in the same style, but of larger dimensions. The great entrance of the present Church of St. Denis, which is round-arched, and of high antiquity, is also asserted to be a remnant of the structure of Pepin and Charlemagne."

The next epoch in French Mediæval art ranges from Charlemagne to Robert the Pious. "If Charlemagne," says Gibbon, "had fixed in Italy the seat of the western empire, his genius would have aspired to restore, rather than violate, the works of the Cæsars; but as policy confined the French monarch to the forests of Germany, his taste could be gratified only by destruction, and the new palace and church of Aix-la-Chapelle were decorated with the marbles of Ravenna and Rome. It was from the church generally called 'Capella' that the town received the name of Aix-la-Chapelle. The halls of his palace were decorated with the most costly ornaments, and marble basins were formed to receive the hot springs in which the emperor delighted to bathe." The works of Charlemagne excelled in taste and beauty all those constructed by preceding French monarchs; and it is probable that he employed Italian artists to imitate, so far as they were able, the monuments of Rome, although Roman architecture had fallen into the lowest state of degradation since the fourth century; nor did it begin to revive till the eleventh century, when Greek artists from Constantinople visited the commercial towns in the north of Italy. The churches, therefore, of the age of Charlemagne were examples of barbarous deformity. In them beautiful columns supported diminutive arches; uncouth paintings rather disfigured than embellished the walls. Pillars of different proportions were sometimes placed in the same line; the narrow windows only admitted a glimmering light; the pavements were uneven; the timbers of the roof were left without ceiling or ornament. Still there was improvement, and an example of the growing taste for the antique is found in the tomb of Charlemagne, which is ornamented with an alto-relievo of the Rape of Proserpine, copied from a pagan sarcophagus.

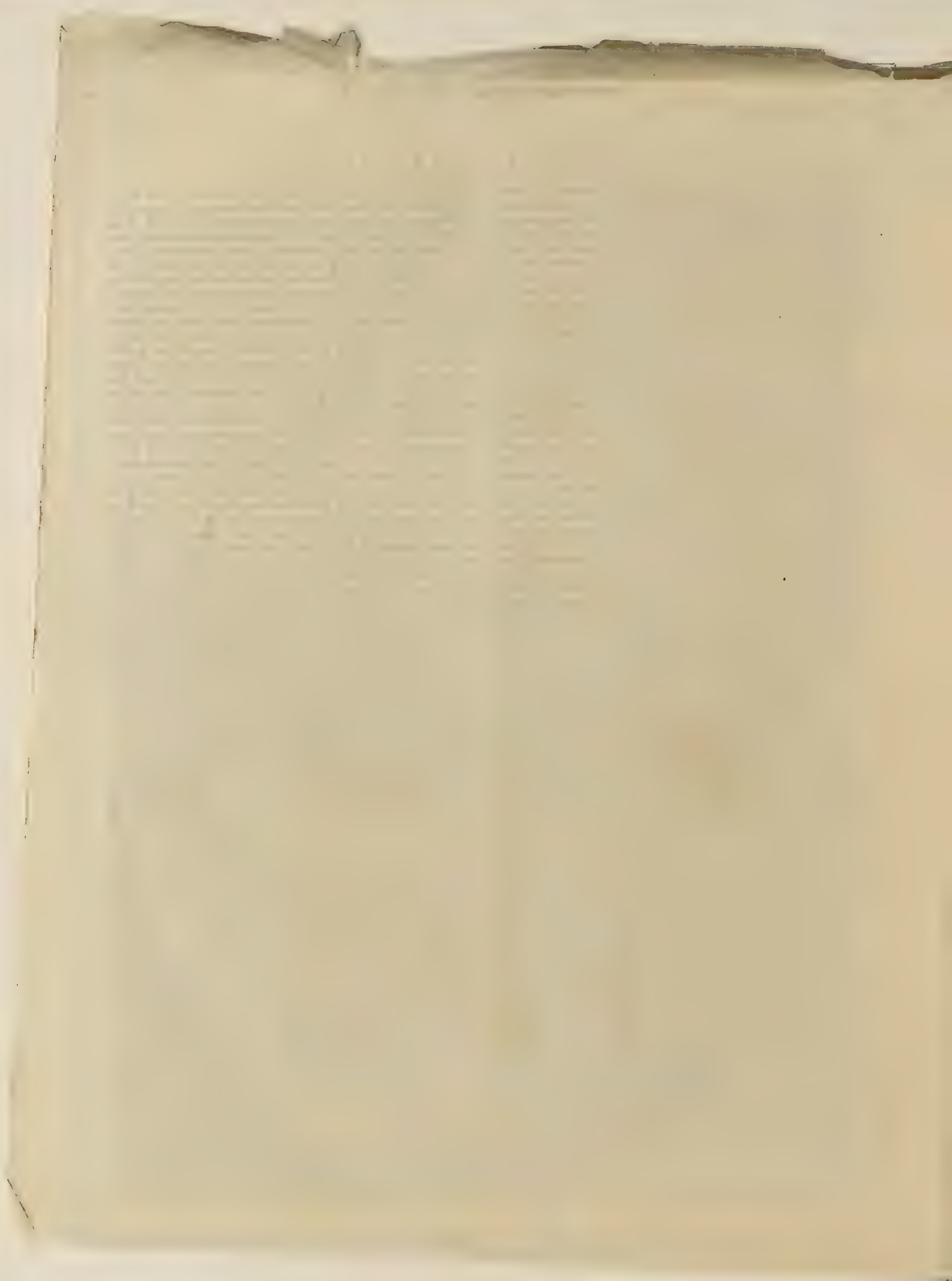
Among the memorable works of Charlemagne was a bridge of 500 paces, which he built across the Rhine at Mayence. His palaces at Ingelheim, near Mayence, and at Nimeguen, on the Waal, were, at the time, deemed magnificent structures. He formed the gigantic project of opening a communication between the Ocean and the Black Sea by uniting the Danube and the Rhine.

It was during the reign of his son Louis that Ebo, Bishop of Rheims, began to rebuild the cathedral, which had become dilapidated, in which he was assisted by Rimalde, the king's architect. At the end of his reign, and under his successors of the Carlovingian race, the advancement of the arts was checked by the incursions of the Normans, who destroyed the Church of St. Ouen, at Rouen, and the Cathedral of Chartres; demolished St. Genevieve, at Paris; ruined St. Martin, at Tours; pillaged the Abbey of Mount St. Michael, and fired, on several occasions, the Abbey of St. Germain des Prés.

The buildings of the ninth and tenth centuries were imitated from those of Charlemagne. In the tenth century a general belief prevailed that the term of a thousand years mentioned in the Apocalypse had arrived, and that the world would shortly be destroyed. In consequence of this belief new buildings were not commenced, and the old fell into decay for want of repair. The only exception was the Abbey of Clugny, built about the year 910 by Berno, Abbot of Balme, with the assistance of William, Duke of Aquitaine and Auvergne. Felibien gives its dimensions. Its length was 620 feet, it had two transepts, the upper 200 feet, the latter 120 feet long. The tomb of St. Hugo, and the painting of the apsis, a work of the twelfth century, but designed with great spirit and freedom, are remains of antiquity particularly worthy of attention.

After this dread of the earth's destruction had passed away,







ecclesiastical structures rose in great numbers, and church architecture was warmly patronised by Robert the Pious. Through his aid, St. Germain des Prés was rebuilt, and St. Genevieve restored. In the eleventh century, Fulbert rebuilt the Cathedral of Chartres, assisted by Canute, King of England, and Richard, Duke of Normandy. Felibien gives the dimensions of the Cathedral of Chartres. The length was 420 feet, and the height 108; the nave 48 feet wide, with aisles of 18½ feet wide, and 42 feet high; on each side of the choir the aisles were double, and the transept, 210 feet long, contained aisles, which seems to have been the first instance of this magnificent arrangement in France. There were seven chapels in the chevet, and the crypts and lower church were built with great art and regularity. St. Remi, at Rheims, was consecrated in 1049, and the cathedral at Sees, in 1050.

The French style of architecture in the eleventh century was modelled on that of preceding centuries, though the constructions were on a larger scale and more solid. With some few exceptions, the oldest buildings now existing in France are to be traced to this era, as St. Germain des Prés, St. Benigne, at Dijon, the cathedral at Chartres, La Charité sur Loire, and Clugny. The Abbey-Church of St. Stephen, raised by William the Conqueror, at Caen, and that of the Holy Trinity, founded in the same city by his queen Matilda, are the principal examples on the continent of that peculiar manner of building which was introduced into England by the Norman prelates at the end of the eleventh century.

The Crusades now commenced, and were followed by a change in the arms, dress, and architecture of every nation in Europe.

In the course of the twelfth century, the pointed arch began to show itself in the edifices of France and the neighbouring countries. Among the earliest instances of this new style in France we may notice the works of Suger, Abbot of St. Denis, which were begun in 1137. About the same period was laid the foundation of the church and monastery of the Knights Templars, at Paris.

In the same century Maurice de Sully, Bishop of Paris, was engaged in constructing the eastern part of the Cathedral of Notre Dame, a work which was carried on with great spirit by his successors, though not completed till two centuries had elapsed. The church and monastery of St. Genevieve were repaired and completed between 1177 and 1192. It has been stated that in the twelfth century French architecture underwent a complete change; during that period it exhibited three distinct characters; at the beginning of the century the old Lombard mode was in practice; towards the middle this became mixed with the new fashion of the pointed arch, and before the end, the ancient heavy manner was everywhere discontinued, and the new, airy, unmixed Gothic universally adopted.

It was in the thirteenth century that the ecclesiastical architecture of France reached the highest point of excellence to which it attained during the middle ages. The most sumptuous churches which now adorn the French cities were constructed in that period. Among these, the cathedral at Rheims began to display the graceful lightness of the new style; the Church of St. Nicaise, in the same city, was commenced; at Lyons, the body of the cathedral was completed; the Cathedral of Amiens, the pride and boast of Gothic architecture, was reared by Robert de Lusarches, Thomas de Cormont, and his son Regnault—while the works of Notre Dame, at Paris, were carried on by Jean de Chelles; Pierre de Montereau was then employed in beautifying the chapel and refectory of St. Germain des Prés. Eudes de Montereau, among other works, built the Church of Notre Dame, at Paris, remarkable for the boldness with which the vaulting of the ceiling is pitched. The height of the roof from the pavement is ninety-six feet. The number of ecclesiastical edifices raised in France during the reign of St. Louis exceeded all former or subsequent example.

The abbots of the Cistercian order, who rebuilt the Church of Notre Dame des Dunes, in Flanders, must be reckoned among the architects of the thirteenth century. The foundations were laid in 1214 by Pierre, the seventh abbot of the convent, and the work was continued by its successors till its completion in 1264. The whole of this edifice was erected by the monks themselves, assisted by the lay brothers and servants, amounting in all to more than eighty persons; and this fact deserves to be noticed as a curious instance of the arts being generally studied and practised in a monastery at so late a period.

Robert de Coucy completed the Church of St. Nicaise, and the cathedral at Rheims. The cathedral at Strasburg was finished in

1275, from the designs of Erwin de Steinbach. Two years afterwards the same architect began to raise the tower which, after his death in 1306, was carried on by John Hilts of Cologne, and completed in 1449 by an architect of Suabia, whose name is unknown.

The Gothic style ceased in France during the fourteenth century. In the two following centuries, France was devastated by the wars which the English carried into the heart of the country, and by the divisions and factions of the French nobility. However, in the earlier part of the fourteenth century, and before the invasion by Edward III. of England, the Church of St. Ouen, at Rome, justly celebrated for the delicacy with which the ornamental parts are executed, was begun to be rebuilt by the abbot, Jean Marc D'Argent, in 1318. The Cathedral of Bourges was erected in its present form in 1324, by Bishop William de Brousse. The collegiate church of St. Sepulchre was begun in 1326. At the beginning of the century, Jean Ravy was employed for twenty-six years at the Cathedral of Notre Dame, at Paris, completing what Jean de Chelles had left unfinished, or, perhaps, enlarging his design. The chapels on the north side of the nave are supposed to have been erected about this time.

Charles V. completed the Chateau of Vincennes, founded by Philip Augustus in 1185. The great tower was begun by Philip de Valois in 1361, and carried by King John to the third story. Charles V. also built the Chateau of St. Germain en Laye, and founded the royal library of France, placing in it 120 volumes, in one of the towers of the Louvre, then called the "Tour de la Librairie." His successor, Charles VI., built the Abbey of Bonport about the year 1387.

The architecture of France in the fourteenth century differed in many of its features from that of the thirteenth. The latter style was not immediately disused; several alterations of character, however, gradually appeared, particularly with regard to the mullion-work of the heads of the windows, which in the thirteenth century were ornamented with six foils or roses, generally three in each window; in the fourteenth they were branched forth into the form of leaves, and the compartments of the round windows at the ends of churches assumed the same fanciful appearance. In some places we may also observe a richer decoration given to the vaulting of roofs. Similar alterations took place about the same time in England, where, from more fortunate circumstances, they were carried to a higher state of magnificence and perfection. In the fifteenth century, we may also notice some specimens of tracery in sepulchral monuments and chapels. In the chapel of Charles de Bourbon, Archbishop of Lyons, in the cathedral of that city, is a beautiful instance of this sort, and one of the latest works in the Gothic taste which were produced in France. Charles de Bourbon died in 1478.

We have now arrived at an epoch when Mediævalism began to be superseded by what is called the "Renaissance." The transition is thus described by Mr. Whittington, who has been our principal guide in the preceding historic narrative:—"The time had now arrived when this beautiful species of architecture, which had been successfully cultivated for the space of three centuries, and which has left fabrics that are still the boast and wonder of the principal cities of Europe, was no longer to be practised; a new era in the arts was arising in Italy; the Gothic manner in painting, sculpture, and building began to disappear, and a taste for imitating the works of antiquity was universally diffused. The Italian artists, struck with the noble remains by which they were surrounded, had for some time laboured to throw off the fantastic style of the middle ages; Gothic architecture, from various causes, had been practised among them with less effect than in other parts of Europe, and they were possessed of better models to excite and assist them in restoring the taste of ancient Rome. Brunelleschi was the first who endeavoured to reform his countrymen in this respect; and the great minds which were devoted to the arts in the fifteenth century, produced a total revolution in all their branches. Painting and sculpture soon arrived at excellence; but although the Gothic mode of building was laid aside, the style by which it was succeeded had little or no pretensions to classical beauty. Its chief and characteristic beauties consisted in earnest imitations of the arabesque designs with which Raphael had adorned the galleries of the Vatican—an idea which he had derived from the frescoes in the baths of Livia and Titus. The richness and variety of these fanciful decorations were well suited to the eyes of those who had been too much accustomed to a profusion of ornament to relish at once a purer and more simple

taste. The political influence which at that time connected France and Italy facilitated the transmission of these innovations, and the reign of Louis XII. was marked by the total abandonment of the Gothic manner, and the adoption of the new, which at the beginning of the sixteenth century was successfully practised by a numerous and able school of French artists."

French students were now sent to Rome to make themselves masters of the new style, among the earliest and most eminent of whom were Jean Texier of Chartres, François Marchand of Orleans, François Gentil of Troyes, and Jean Juste. These were indebted to the munificence of the Cardinal D'Amboise, and afterwards employed by that minister in ornamenting his palace. The Chateau Gaillon exhibits the most perfect example of the taste which prevailed at that time.

superstition of the age, were afraid that St. Vincent would work some miracle to their discomfiture, and granted peace on condition of their receiving the holy shirt of St. Vincent. With this rich spoil Chilbert returned in triumph to Paris, and he also displayed as a trophy a large cross which he had taken at Toledo. Soon after his arrival, St. Germain, Bishop of Paris, persuaded him to build a church in honour of those sacred emblems. The site was chosen in a meadow on the banks of the Seine; the structure was commenced in the year 557, and finished in the following year. It was called St. Germain after the name of the bishop, and Des Prés from the meadow in which it was erected. However, it was not till after the death of the bishop that the church took his name, as it was originally called the "Holy Cross," or the Church of St. Vincent and the Holy Cross.



FRENCH MEDIEVAL COURT.

After this general sketch of French Mediæval art, we shall give a brief historical view of its principal specimens of ecclesiastical architecture, commencing with—

THE ABBEY-CHURCH OF ST. GERMAIN DES PRÈS.—In the sixth century, Chilbert declared war against Theudis, king of the Visigoths, and invested Saragossa. The inhabitants, reduced to the last extremity, were nevertheless unwilling to surrender; but aware that they could not offer a protracted resistance, they made a solemn procession round the walls, carrying the holy shirt of St. Vincent, who had been one of their countrymen. A peasant, who had attempted to escape from the beleaguered town, was seized and taken into the presence of the French prince; he explained the nature and object of the procession which had been witnessed from the camp of the besiegers. The French leaders, infected with the

This edifice is described in terms of considerable magnificence by the old writers. The cruciform shape was adopted in honour of the cross of Toledo; the fabric was sustained by large marble columns, the ceiling was gilt, the walls were painted on a gold ground, the pavement was composed of rich mosaic, and the roof externally covered with gold; in consequence of this profuse splendour it was called St. Germain le Doré. Considering the state of society when this edifice was built, a pardonable scepticism may fairly consider the description as surcharged with exaggeration, the more so as it was written two centuries after the church had been twice fired by the Normans. The marble pillars were probably of stone, the gold we may suspect was gilt bronze, and the ceiling, as was common at that time, was most likely composed of naked timbers, which had received some polish. Lead may have been used, and as it was then

scarce and dear, some ornamentation with that material may have acquired for the church the title of "Doré."

In the year 990, the Abbot Morard pulled it down, on account of its dilapidated condition, and rebuilt it from the foundations, leaving the main structure nearly as it is at present. He died in 1014, but the new church was not dedicated till 1063, when that ceremony was performed by Pope Alexander III., who had taken refuge in France. A new refectory was commenced by Abbot Simon, in 1236, and in 1244 the grand Chapel of the Virgin was undertaken. These exquisite specimens of Gothic architecture were built from the designs of Pierre de Montereau, and are remarkable examples of his extraordinary taste and skill. In 1555, the high altar, dedicated by Pope Alexander III., was destroyed to erect another in the style of the sixteenth century. In 1646, the building had fallen into dilapidation; many parts of the ceiling were broken and the pavement had sunk. The restoration of the church was consequently undertaken: the nave was for the first time vaulted with stone, and the vaulting of the transept renewed; the pillars were ornamented with composite capitals, and some of the windows enlarged.

occurs in the crypt of St. Denis, in the choir of the Church of La Charité sur Loire, and at the east end of Canterbury Cathedral, built between 1180 and 1185, "Where," says Mr. Gostling, "the arches are some circular, others mitred; for the distances between the pillars thus diminishing gradually as we go eastward, the arches, being all of the same height, are mitred (that is pointed) to comply with this fancy, so that the angles of the eastern ones are very acute."

The CATHEDRAL OF NOTRE DAME was the work of several centuries, but was principally erected at the close of the twelfth and during the thirteenth century. Its foundation, however, was laid by Childebert, in the year 522, who dedicated it to the Blessed Virgin. The earliest structure was ruined by the Normans. The foundation of the present cathedral, in the year 1010, is referred to King Robert the Pious, but it was neglected after his death. In 1165 it was greatly extended by Maurice de Sully, Archbishop of Paris, who is considered the principal author of the present edifice. Pierre de Nemours, who died in 1220, is supposed to have finished the nave and west front, and his successors of the thirteenth century



ENGLISH MEDIEVAL COURT.

The original character of the edifice, however, underwent but little change, and it still presents a striking and curious exhibition of the architecture of France at the beginning of the eleventh century. The western tower is thought by many French antiquarians to be part of the edifice of Childebert; others refer it to the age of Pepin and Charlemagne. The portal of this tower is decorated with statues, but their date is disputed, some believing them to represent Childebert and his family. They are very uncouth. The interior is low and gloomy. The Rev. G. D. Whittington remarks—"Here columns support a series of round arches, except in the semicircular arcade at the eastern end of the church, where they are pointed in consequence of the arrangement of the pillars, which being placed in the bow nearer each other than where the colonnade proceeds in a straight direction, the arches rising from them, when brought to an equal height with those of a round shape, become necessarily pointed; and this is among a number of instances where the pointed arch was used from accident or necessity before it had become an object of taste." He adds that the same circumstance

completed the necessary addition of the transepts; that to the south was begun in 1257. Such are the principal eras of this great work, but the building of chapels was continued during the greater part of the fourteenth century. This structure is particularly heavy from the plainness and thickness of the buttresses, and principally from the want of relief and finish in the towers. The interior is heavy from the mixture of styles. The body of the cathedral is divided into five aisles by four ranges of Lombard columns; these columns are for the most part of gross and clumsy proportions, and the Gothic work in general is without ornament or beauty; its size, therefore, is the principal source of magnificence of which it can boast. It has a peculiar attraction in its three marigold windows, and painted glass. The Crystal Palace contains a series of sculptures illustrating the "Life of Christ," taken from the choir; four medallions from the Chapel of St. Stephen, in the cathedral, above which is the figure of the Proto-Martyr, and twelve seated figures from the same chapel. There is also a fine series of scriptural subjects, displaying the style of early Gothic art.

The ABBEY OF ST. GENEVIEVE was built on a small island of the Seine, where the ancient Celts had founded a town, and where now stands the centre of Paris. This island, called "L'Isle de la Cité," still retains the metropolitan church and the Palace of Justice, which was the ancient residence of the Counts of Paris. Here many of the Roman emperors fixed their winter quarters, particularly Julian. After his conversion, Clovis brought his treasures to Paris, and there fixed his residence. He built a palace in the southern suburb of the city, and near to it a church in honour of St. Peter and St. Paul, where he was interred. His epitaph states that he engaged in this pious work at the entreaty of his wife, Clotilda, and of Madame Sancte Genevieve, whose legend abounds in miracles. Her history, however, is deemed a monkish fable, and her name supposed to be a corruption of Janua Nova. The original structure was partially burnt by the Normans. It was repaired by Robert the Pious, in the eleventh century. This monument is valuable as exhibiting the exact shape of the early French churches, and as affording a specimen of the narrow lancet window, which is very rare in France.

ST. DENIS.—St. Dionysius or Denis, has been considered the first preacher of the Gospel to the Gauls, and to have terminated his career by martyrdom. His persecutors ordered that his body, and the bodies of his two associates, Rusticus and Eleutherius, should be thrown into the Seine. The persons who were to carry this command into effect were invited to the house of a woman named Catalla, who offered them refreshment, and while they were partaking of it, she desired her servants to carry off the bodies, and bury them in a field six miles distant from Paris. This was done. Catalla then sowed the field with wheat to conceal the place of sepulchre, and when the persecution ceased, she erected a monument over their remains. Then miracles were wrought on the spot, and in a short time a church was dedicated to the principal martyr. These events are referred to the middle of the third century.

The original structure soon disappeared, and Dagobert erected a new one on a grander scale. Dagobert's biographer, a monk of St. Denis, who wrote 150 years after that king's death, says that the new edifice had marble columns, and that the pavement was of the same material. The interior he describes as brilliant with gold, jewels, and precious stones, especially the shrine executed by St. Eloy. In the succeeding century the church of Dagobert was taken down, and replaced by a more magnificent structure, commenced by Pepin, and completed by his son Charlemagne, by whom it was consecrated. It shared the fate of many other ecclesiastical edifices, being plundered by the Normans. In 1122, the celebrated Suger was elected Abbot, and when Louis VII. departed for the Holy Land, he was nominated Regent of France. He greatly added to the cathedral, and was favoured in his plans by the discovery of a fine quarry of stone at Pontoise, while he obtained timber for the roof from the forest of Chevreuse, he himself selecting and marking the trees.

Sir Christopher Wren observes, "The Church of St. Denis is externally a lofty and striking fabric when seen from the east, the north, or south sides; the height of the windows, the delicacy of the sculpture, and what has been quaintly termed the 'flutter of arch buttresses and abundance of busy work,' produce an effect of confused richness and varied light and shade, which forms one of the greatest triumphs of this style of architecture. The west front, however, is deficient in majesty and decoration. The chief portal is arched semicircularly and adorned with sculpture, but the walls above it are thinly ornamented with ranges of alternate round and pointed arches, in half relief, on little pillars similar to those of Purbeck stone, so frequent in our churches. The height of the towers is unequal, which materially affects the beauty of the fabric; they are crowned with slate spires, and perforated with round-headed windows."

St. Denis contains examples of three eras of French Gothic architecture. The first exhibits the oldest specimen of ornamental building remaining in France. The lower church beneath the chapel of St. Denis is with good reason decided to have been part of the ancient fabric erected by Pepin and Charlemagne in the eighth century. The rudeness of the architecture, and the effigies of those monarchs sculptured on the capital of one of the columns, seem to leave no doubt on the subject. The great gate is said to be of the time of Charlemagne, and perhaps the mere masonry may be of that antiquity; but there can be no doubt that the decorations and statuary were added afterwards, in the twelfth and thirteenth

centuries. The chapels of the Chevet, and some part of the eastern arcade of the church, are remains of the works of Suger, to whom also must be attributed the western front. The pavement and the painted glass of the east end are of the same date. The columns erected by Suger are in the Lombard style, but the pointed arch occurs in every part of his work, which was all executed before the middle of the twelfth century, while it is certain that the Church of St. Denis was finished in the year 1144. "These dates," observes the Rev. G. D. Whittington, "lead to the conclusion that the French preceded the English in the use of the pointed arch. All authorities concur in fixing the reign of Henry II. (that is after the year 1154) as the earliest era of the introduction into England of the mixed style of round and pointed arches. The first work in which the pointed arch decidedly occurs in this country (for the dubious instances of St. Cross, built in 1132—1136, cannot be admitted by any one who wishes to proceed on sure grounds), are the vaults of Archbishop Roger at York, begun in 1171; the vestibule of the Temple Church, built in 1184; the great western tower of Ely, finished in 1189; the choir at Canterbury, carried on between 1175 and 1180; and the two western towers of Durham, which are almost exactly in the same style as Suger's front of St. Denis, erected in 1233."

The CATHEDRAL OF RHEIMS has long been celebrated as the most beautiful of all the ecclesiastical edifices of France. The foundations of the earliest structure were laid in the year 818, by Archbishop Ebo, to whom King Louis I. granted the walls and gates of the city for materials; but it was not completed till 847, when Charles the Bald granted Archbishop Nicomar various privileges. The first cathedral was consecrated in the year 862. It was burnt in 1210, with the exception of the crypt. The new building was completed in 1241, but the tower next to the archbishop's palace was not added till the year 1430. It is the most beautiful and perfect piece of Gothic architecture in the world. It is thus minutely described by the Rev. G. D. Whittington:—

"Viewing it laterally, the lightness and grace of the windows, the number, richness, and finish of the buttresses, the admirable taste of the open work, the nice disposal of ornament, and the uniformity of the whole, form a mass of consistent beauty and grandeur which is as inimitable as it is unrivalled. The stately plainness of the tower, and the decoration, without heaviness, of the upper parts, are well worthy of admiration; but it is the west front which has long been the boast of France, and which is the perfection of its style. Its general proportions are excellent, and the richness and delicacy of its ornamentation cannot be surpassed. That these praises may not be thought extravagant and unfounded, I will point out distinctly its beauties and the causes of its superiority. The diminishing or pyramidal form is in itself more graceful, and it is certainly more congenial to the Gothic style, than the square fronts of our cathedrals. It has the advantage which is possessed by some of ours, of having no mixture or confusion of design; but here how nobly have the invention and taste of the architect been displayed. He has surpassed every other front in richness, at the same time that he has excelled them in lightness; he has judiciously placed all his heavy magnificence below, and has gradually lightened and relieved his ornaments as they rise to the summit; the eye is delighted without being confused; everything partakes of the pyramidal and spiral form, and the architecture is preserved as delicate and as light as possible, as a contrast and relief to the sculpture. One of the chief and distinct excellences of this *façade*, and that which renders it superior to all in this country, is the admirable magnificence of the portal, and its just proportion to the rest of the building. The great entrance to a cathedral should be always worthy of the structure to which it leads; and this circumstance seems never to have influenced the English architects, who have expended their chief care in the construction of a magnificent west window, beneath which invariably a mean and disproportionate door presents itself. We have not a single door worthy of our churches, and in this respect the French churches, with their ample portals, and marigold windows, have externally a decided advantage. The Gothic portal in England, which is most in proportion to the height of the building above it, is that of the north transept of Westminster Abbey, which is, as to its whole plan, very much in the French style. The name of the original architect is lost, but the completion of the cathedral and its decorations, the pinnacles finished with figures, flowers, and crosses, and the *fleur-de-lis* spread along the roof, are attributed

to John de Coucy, who is known to have superintended the work during the latter part of the thirteenth century."

The Cathedral of Rheims is peculiarly rich in what has been happily called "*mural flora*," for a list has been made of carved fruits and flowers, embracing twenty varieties; among those most frequently repeated are the vine, the ivy, laurel, oak, and ranunculus. The Crystal Palace contains fine specimens of statuary from this cathedral, especially from the portal, and figures of angels from the Last Judgment.

The ABBEY OF ST. NICAISE, at Rheims, is supposed to have been originally founded in the fourth century. That building fell into complete decay, and a new one was built on the old site in 1056. That also perished, and the present structure was raised in the year 1216. It was called after St. Nicaise, an Archbishop of Rheims, who was decapitated in the ancient abbey in the fifth century. Robert de Coucy was the architect, or rather he finished the building, and the choir, the transept, and the surrounding chapels, are due to him. This abbey is not remarkable for its size, but it is well proportioned, and admired for the lightness and elegance of its proportions. Its beauty arises from perforation and relief, more than from sculpture or ornament. It has a magnificent marigold window. In comparing St. Nicaise with churches built at the same period in England, we find that the French preceded us in the higher styles of Gothic architecture. In the plans of the French architect, Hugh Liberger, which appeared in 1229, may be seen windows and perforations having the same width and mullions as those afterwards used in England, for the first time at Westminster Abbey; we also find a profusion of arch buttresses, and a delicacy of finish unknown to us at that period; western towers, of which we have no contemporary instance, and a marigold window which, for magnificence, we could not equal for nearly half a century afterwards.

THE CATHEDRAL OF AMIENS.—The present edifice was commenced in the year 1220, under the auspices of Bishop Evrard, by the famous architect Robert de Lusarches, and completed in 1288 by Bertrand D'Abbeville, excepting the towers, which were not erected till the fourteenth century.

The Cathedral of Salisbury was commenced in 1220, and completed in 1258; so that the dates of Amiens and Salisbury nearly coincide. The Rev. G. D. Whittington has selected them to illustrate the progress and character of Gothic architecture in France and England; and we transfer his minute and masterly criticism to our pages.

"The chief characteristics of the thirteenth century with us, were the highly pointed arch struck from two centres and including an equilateral triangle from the impost to the crown of the arch, the lancet-shaped window, and, to use the words of one of the most useful writers on the subject (Mr. Bentham, in his *History of Ely*), 'Purbeck pillars, very slender and round, encompassed by marble shafts a little detached,' and a profusion of little columns of the same stone in the ornamental parts of the building. All these particularities are to be observed in Amiens Cathedral; the arches of the aisles are like those of Salisbury and Westminster; the pillars are according to Mr. Bentham's description; the west part is covered with innumerable small columns; and the lancet-shaped arch, though not adopted in the windows, is to be seen with admirable effect crowning the semicircular colonnade at the east end of the choir. The vaulting too is like that of Salisbury, high pitched between arches and cross springers only, without any further decorations. The dissimilarities come next to be discovered, and these are so numerous in plan, proportion, and ornament, that they may be said to constitute the general character of the building. 1st. The disposition of the church with the aisles to its transepts, its double transepts on each side of the choir, together with its beautiful semicircular colonnade at the end of it, will be allowed to be material dissimilarities; and, from the number of columns it presents at every point of view, an infinitely richer effect is produced than within any of our churches of the same date. 2dly. The proportions of the whole cathedral, particularly its surprising loftiness, the height of the pillars to the arches, and many other details, will be also found exceedingly dissimilar, if we compare them with the English edifices of the same period. 3dly. In the ornamental part, however, the chief difference exists; the west front, which has a portal of just and magnificent proportions, exhibits the most gorgeous display of statuary; armies of saints, prophets, martyrs, and angels, line the doorways,

crowd the walls, and swarm round all the pinnacles; nothing can be more rich, and nothing, both in design and effect, can be more different from Salisbury. If it be found that the latter has the advantage in point of lightness, it should still be remembered that not lightness, but richness, was the principal object in this part of the building. The next dissimilarity that I shall point out regards the bowes, or arch buttresses, which it was our custom, in the early part of the thirteenth century, to conceal in the roofs of the side aisles, as may be seen at Salisbury, Lincoln, the small transept at York, at the east end of Canterbury, in the twelfth century, and in other instances. The profusion of these at Amiens is very striking, and the manner in which they are managed and relieved by ornamental perforations deserves great admiration; but the chief difference between Amiens Cathedral and its contemporary buildings in England consists in the size, dimensions, and magnificence of its windows. The long, narrow, sharp-pointed window, generally decorated on the inside and outside with small marble shafts, is employed all over Salisbury Cathedral; these are often combined together, surmounted by a rose, and persons fond of tracing the progression of Gothic architecture, are eager to point out, in these combinations, the outline of the more spacious and magnificent windows which were not adopted in the English churches till half a century afterwards; but we find at Amiens, in the plan of Robert de Lusarches, in the year 1220, windows of a width and stateliness which were never surpassed in this country. Amiens Cathedral consists of two tiers of these magnificent windows; those of the nave are divided by three perpendicular mullions, surmounted by the same number of roses. Those to the east of the transepts have five mullions and three roses, and are crowned by a pediment ornamented with a trefoil; three most noble and circular marigold windows, full of stained glass, enrich the transepts and west front of the edifice; so completely light is this cathedral, and so artfully and delicately is it constructed, that, except in its west front, hardly any wall is visible throughout the whole building; it is all window. Between those of the lower story, room only is left to insert a narrow buttress, which rises up into a pinnacle, and branches out into bowes above; these meet the building just under the vaulting of the roof, and are received on the small slip of stonework which divides the upper windows. Internally, there is no range of open arcades between the arcades of the nave and the upper tiers of windows, which is found in all our cathedrals."

LA SAINTE CHAPELLE was built by Pierre de Montreuil, who died in 1266. He was the favourite artist of St. Louis. At that time, the principal residence of the French monarch was in the Islet of the City of Paris, where he administered justice to his subjects, and which afterwards became the seat of the parliament of Paris. The ancient palace of the counts of Paris had been repaired or rebuilt about the year 1003 by Robert the Pious; who, at the same time, erected a chapel within it, dedicated to St. Nicholas. In the year 1154, Louis Le Jeune repaired it; but it is to St. Louis that France owes its magnificent reconstruction, which commenced in 1245. He was induced to undertake this pious work at the entreaty of Baudouin or Baldwin, son of John de Brienne, King of Jerusalem, who was endeavouring to raise troops in Italy and France for the defence of Constantinople, captured in 1204 by the French and Venetians, but then besieged by the Greeks both by sea and land. Baudouin, fearing that the Greeks would recover the city, urged St. Louis to erect a sanctuary for the "Crown of Thorns," then preserved at Jerusalem, and which he promised to give to the French monarch rather than allow it to fall into the hands of the schismatic Greeks. Louis consented, and built La Sainte Chapelle, and though it did not cover a large space of ground, it was remarkable for boldness, richness, and grace. The Chapel of the Virgin, at St. Germain des Prés, is nearly the same in design, and but little inferior in beauty. They are both evidence that France was very superior to England in the thirteenth century in the decorative and tasteful style of Gothic architecture.

Tacitus, in his *Life of Agricola*, praises that Roman general, while governor of England, for introducing among the semi-barbarian Britons a taste for building, encouraging them to erect temples, courts, and market-places. He thus induced them to abandon their roaming and unsettled life, and to prefer tranquillity to war. Agricola ruled about A.D. 80, and from his time till the middle of the fourth century, architecture was cultivated; but when the Romans abandoned the island, and the devastations of the Saxons commenced, nearly all public and private buildings were

involved in one common ruin. This destruction lasted during the wars of the heptarchy, and only terminated when Egbert became sole king. The first known patrons of building on a grand scale were Wilfrid, Bishop of York, and afterwards of Hexham, and Benedict Biscop, founder of the Abbey of Weremouth. The latter obtained glass from France, till his time unknown in England. The Saxons adopted a massive style, which some have called the Saxon-Gothic; the Normans introduced a light and airy style, which has been termed Norman-Gothic; on this form of archi-

inflamed their piety, they struck out a new species of architecture, unknown to Greece and Rome, upon original principles and ideas much nobler than what had given birth even to classical magnificence. For this northern people, having been accustomed during the gloom of paganism to worship the deity in groves (a practice common to all nations), when their new religion required covered edifices, they ingeniously projected to make them resemble groves as nearly as the distance of architecture would permit, at once indulging their old prejudices, and providing for their present



CLOISTERS LOOKING TOWARDS PRINCE ARTHUR'S DOOR.

itecture Bishop Warburton has pronounced the following criticism:—

‘Our Gothic ancestors had juster and manlier notions of magnificence, on Greek and Roman ideas, than those mimics of taste who profess to study only classic elegance; and because the thing does honour to the genius of these barbarians, I shall endeavour to explain it. All our ancient churches are called without distinction Gothic. They are of two sorts; the one built in the Saxon times, the other in the Norman. When the Goths had conquered Rome, and the genial warmth of religion had ripened their wits and

conveniences by a cool receptacle in a sultry climate. With what skill and success they executed the project appears from hence, that no attentive observer ever viewed a regular avenue of well-grown trees intermixing their branches overhead, but it presently put him in mind of the long vista through the Gothic cathedral, or ever entered one of the larger and more elegant edifices of this kind, but it presented to his imagination an avenue of trees, and this is what may be truly called the Gothic style of building. Under this idea of so extraordinary a species of architecture all the irregular transgressions against art, all the monstrous offences

against nature disappear; everything has its reason, everything is in order, and an harmonious whole arises from the studious application of means proper and proportionate to the end. For could the arches be otherwise than pointed when the workmen were to imitate that curve which branches of two opposite trees make by their insertion with one another? or could the columns be otherwise than split into distinct shafts when they were to represent the stems of a clump of trees growing close together? On the same principles they formed the spreading ramification of the stonework in the windows, and the stained glass in the interstices; the one to represent the branches, the other the leaves, of an opening grove, and both concurred to preserve that gloomy light which inspires religious reverence and awe. Lastly, we see their studied aversion to apparent solidity in these stupendous masses, deemed so absurd by men accustomed to the apparent, as well as real strength of Grecian architecture. Had it only been a wanton exercise of the artist's skill to show he could give real strength without the appearance of any, we might indeed admire his superior science, but we must needs condemn his ill judgment. But when one considers that this surprising lightness was necessary to complete the execution of his idea of a sylvan place of worship, one cannot sufficiently admire the ingenuity of the contrivance. This, too, will account for the contrary qualities in what we called the Saxon architecture. The first places of Christian worship were sepulchres and subterranean caverns, low and heavy from necessity. When Christianity became the religion of the state, and sumptuous temples began to be erected, they yet, in regard to the first pious ages, preserved the massive style, made still more venerable by the Church of the Holy Sepulchre, where this style was followed."

The Pointed style in England has been divided into epochs. The first, styled Early English, includes the entire thirteenth century. The second is called the Decorated, and chiefly characterises the fourteenth century. The Perpendicular belongs to the fifteenth and sixteenth. As examples of the first style may be mentioned the west front of the Cathedral of Wells, Lincoln Cathedral, Salisbury choir and its Chapter-house, and the front of the northern transept of Westminster Abbey. As examples of the second, we may quote the west front of Exeter Cathedral, though the towers are semi-Norman; the octagon of Ely Cathedral, front of Henry the Fifth's chantry, Westminster, and York Minster. King's College Chapel, Cambridge, is a magnificent specimen of the third style.

Winchester Cathedral, erected in 1093, though the west end was rebuilt by William of Wykeham in the thirteenth century, affords a very singular instance of both the Saxon and Norman styles. "The aisle," says Bishop Lowth, "was originally of the Saxon architecture, with round pillars, much stronger than the Doric and Tuscan, with round-headed arches and windows, and plain walls without buttresses. Wykeham's design was to rebuild the whole of it in the Norman style, but perceiving the foundation to be precarious—on low, moist, and loose ground—he determined to leave the old Saxon pillars standing, and cased them round with new work, imitating in some degree the clustered pillar and pointed arch of the Normans. These circumstances, in which stability and security were very wisely in the first place consulted, have been attended, however, with some inconvenience, as it seems owing to them that this building has been censured for want of that lightness and freedom and that elegance of proportion which might have been expected from Wykeham's known taste in architecture, and from the style and manner of his other works in this kind, of which we have evident examples in the chapels of both his colleges, especially in the western part of that of New College, in Oxford, which is remarkably beautiful. However, with all its defects, there is no fabric of its kind in England; after those of York and Lincoln, which excels this part of the Cathedral-Church of Winchester in greatness, stateliness, and majesty." Other genuine remains of the old Saxon style may be seen in the Cathedral-Church of Ely, in Chestow Priory, in the conventual Church of Rumsey, in Canterbury and Gloucester Cathedrals, and in most of our ancient churches throughout the kingdom.

It is presumed that when the Romans evacuated Britain, the Saxons introduced the Gothic style, which prevailed till the end of the fifteenth century. Of this architecture there are two styles, the one short, round, massive in the column, resembling the trunk of the most sturdy oak, and plainly intended to secure strength and durability. It was also distinguished by its semicircular, round, or horse-shoe arch, and plain thick walls, without buttresses. The

other style is characterised by its slender columns, or cluster of columns combined in one, resembling a number of slender trunks of trees, united or tied together, decorated with a pointed arch, a profusion of ornaments, buttresses, and pinnacles. This improved style was introduced under the Norman government, when science and the arts began to revive. In the very year of the conquest, William and his queen Matilda had displayed their piety, and the architects their taste, in founding in Caen the two abbey-churches, one called *Aux Hommes*, and the other *Aux Femmes*. The Conqueror intended to be buried in the former, which was consecrated by Archbishop Lanfranc, the first abbot, in 1077. The latter was designed as a nunnery for noble ladies. The Norman architects not only brought their skill to England, but their material, for the quarries of Caen furnished stone, abundantly used in this country during the middle ages, as in the instances of old London bridge, Henry the Seventh's Chapel, and Winchester and Canterbury Cathedrals.

Winchester is the longest cathedral in England; it has no towers to the western front; there are aisles at the north and south ends of the transept, a very peculiar arrangement. This cathedral and that of Wells are remarkable for their sculptures. Those contained in the former are supposed to have been ordered, in the judgment of Mr. Cockerell, by the famous Bishop Grossetete, author of some allegorical religious works. The whole series comprises thirty compartments. The west front of Wells Cathedral is covered with statues of kings and bishops of the diocese, combined with scriptural subjects. At Lincoln are two statues of seated kings, there erected by the treasurer, Welbourne, about the year 1377.

Rochester Cathedral has a double transept, but no aisles to either; the Chapter-house runs parallel to the choir, and is entered by a vestibule from the eastern transept; the Lady Chapel adjoins the west wall of the south wing of the greater transept; the cloisters are eastward of the choir. In the English Mediæval Court is a beautiful example of the late Decorated style, from the Chapter-house of Rochester Cathedral, said to have been erected by John de Shepey, bishop, about the year 1352. It is thus described by Mr. Digby Wyatt:—"The two lowest figures on each side represent the Church, symbolised by a prelate in full pontificals, supporting a church with one arm, and armed with a pastoral staff, the crook of the true shepherd. The Synagogue is typified by a female, blinded by a bandage over her eyes, with a fallen crown, a broken staff, and the tables of the old law reversed. The four figures above them, seated before lecterns and holding scrolls, may possibly represent the evangelists, but they are without the usual symbols, and are generally supposed to be Gundulph, Ernulph, Laurence de St. Martin, and Hamo de Hethe—the two first being celebrated, the one as the founder and first bishop of the cathedral, the other as the compiler of the *Registrum Roffense*. The other two were bishops in the thirteenth and fourteenth centuries, Hethe being the immediate predecessor of John de Shepey, by whom the doorway was built. Above them, on each side, are angels or youths with wings, half hidden in flames, who appear to cry out to a soul, represented by a small human figure in glory, beneath a centre canopy. It has been suggested that these may signify human beings in purgatory, and the central figure be intended for Christ risen from the dead. The numerous grotesque and fanciful heads of the inner hollow moulding, the demons' heads contained in quatrefoils beneath the Church and the Synagogue, and the foliage running in and out of circles on the external angle are exceedingly curious."

The arrangements adopted in the construction of the Mediæval Court admirably present the greatest possible diversity of styles in architecture in the smallest space; but the plan is attended with this disadvantage, that everything is fragmentary, and nothing is complete. Thus, the entrance of the façade of the English Mediæval Court is decorated on one side by figures taken from Westminster Abbey, and on the other by figures taken from Wells Cathedral, while the doorway is copied from the west front of Tintern Abbey, and the rest of the façade taken from Guisborough Abbey. In the elevation in the interior are grouped together a monument to Prince Arthur, a screen from Winchester, figures from the tomb of Aymer de Valence, at Westminster, a canopy from Beverley, knights from Lincoln, figures from Henry the Seventh's Chapel, Westminster, John of Gaunt's canopy, monument to Bishop Alcock, a niche from York, and figure of a Virgin, a statue of King Ethelred from Wells

Cathedral, the second David crowned, the first and last of the Lincoln angels, the Angel of the Sun and Moon, and a statue from Wells of Birinus the Missionary. The elevation of the side of the Court opposite the entrance from the Nave is composed of a canopy of the Virgin, from York; figures from Armagh Cathedral, supporting Winchester altar-screen arches; the sitting kings from Lincoln, already mentioned; niches from Southwell Minster; Hawton Sepulchre; arcades from Ely Chapter-house; figure of an archbishop, forming one of the finials to Archbishop Greenfield's Monument, in York Minster; Corbels from Wells Cathedral; niches from Beverley; Rochester Chapter-house door; tomb of Humphrey de Bohun, from Hereford Cathedral; and Mary Magdalen from Westminster niche. The elevation of the interior of the English Mediæval Court, towards the Central Transept, shows a pedestal from Henry the Seventh's Chapel, with figure of Mary Magdalen, from Oxford; a niche from Beverley, with an Annunciation from

placed above the tomb of Sir Thomas Daubeny, who died in 1500, having been Governor of Calais. He received the Order of the Garter from Henry VII. One of the most beautiful of the tombs, and indeed one of the most interesting monuments in England, is that of Richard Beauchamp, Earl of Warwick, taken from the Beauchamp Chapel, Warwick, and formed of Purbeck marble, but the effigy of the earl is of brass, gilt. He was born in 1381, and was the pride of the chivalry of his age, the recognised champion of the queen, the conqueror of Owen Glendower of Wales—by some stigmatised as a rebel, by others exalted as a patriot, but who lost his standard to Beauchamp. Beauchamp fought at the battle of Shrewsbury, visited Palestine, was received honourably at Jerusalem, and on his return displayed his knightly accomplishments in many tournaments at various courts in Europe. At the coronation of Henry V. he was made High Steward of England and Governor of VI. The Commons appointed him guardian to Henry VI.



TOMB OF THE BLACK PRINCE.

Wells, underneath; Lincoln door, with Haddingfield Cross; the monument of Bishop Bubwith, from Wells Cathedral. As a beautiful specimen of pictorial art, we have engraved a view of the Cloisters,* looking towards Prince Arthur's door. These need no description; and it is only necessary to observe that in the cloisters attached to cathedrals and monasteries, distinguished churchmen were frequently buried, and it was deemed a mark of honour and respect.

In the gallery of the Mediæval Court are many interesting tombs of the illustrious dead, which enable the spectator to form a very fair judgment of the style of Mediæval sculpture. One from Elford Church, Staffordshire, presumed to be that of Sir Thomas Arden and his wife Matilda, both in alabaster and recumbent, are well worthy of minute inspection, especially in the details, which show the costume of the period. The effigies of King Richard II. and of his queen, Anne of Bohemia, from Westminster Abbey, are

On the death of the Duke of Bedford, he was appointed his successor as Lieutenant-General of France, and within a few years after obtaining this high position, died at Rouen in 1449.

Bishop Beckington's monument is an admired example of the Perpendicular style: it is taken from Wells Cathedral. Canterbury Cathedral contributes the tombs of King Henry IV. and his queen, Joan of Navarre. This king was son of John of Gaunt. On his father's death, he became Duke of Lancaster and Earl of Derby; on the death of Richard II., who had banished him, he became king of England. The tombs have an upper row of panels or compartments, filled in with figures of kings and angels, copied from the stalls of Lincoln Cathedral, while the lower range are from St. Stephen's Chapel, Westminster, specimens of the Decorated style.

In the gallery may also be noticed the monument of Archbishop Conrad, of Weinsburg, from Mayence Cathedral, who died in 1396. The face is excellent, and all the details are rich to magnificence. From the Wells statues, there is a statue of Christ crowning the

* See Engraving, p. 128.

Virgin; in his hands he carries the worldly ensigns of a globe and a sceptre, indicative rather of temporal power than of spiritual supremacy. Wells also furnishes the statues of King Ina and Queen Ethelburga. He founded the Conventual Church of Wells and restored Glastonbury Abbey, and flourished in the eighth century. One of the most beautiful monuments in this division of the Mediæval Court is the tomb of the Black Prince, son of Edward III., whose heroic career is too well known to require any description. We have engraved his monument from Canterbury Cathedral. The recumbent figure of the hero is appropriately clad in complete armour, and is formed of brass. A jewelled coronet encircles his helmet; his hands are piously raised in prayer. The accessories to the tomb commemorate his martial achievements. The crest of three ostrich feathers, and the motto "Ich Dien" (I serve), recall the battle of Cressy, where the king of Bohemia was slain. The shields in the compartments of the monument represent the heraldic arms of France and England, and an inscription reminds the observer of the mutability of human greatness, and the emptiness of mere worldly triumph.

We now pass to the German Mediæval Court, rich in various illustrations of German art taken from Munich, Nuremberg, the Cathedral of Ulm, Langen, near Darmstadt, Mayence, Cologne, Augsburg, and Prague. The elevation of the wall of this compart-

the Cross." In this church are several productions of Veit Stoss, a native of Cracow, but who passed the longer period of his life in Nuremberg, as the head-quarters of German art. He was a carver in wood. A crucifix and figures of the Virgin and of St. John, over the high-altar, are among his artistic contributions to St. Sebald's. Peter Vischer and his five sons, sculptors and casters in bronze, were employed during thirteen years in executing the shrine of St. Sebaldus—a miniature Gothic chapel, round which, in niches, are grouped the figures of the twelve apostles, and above them, but of more diminutive size, are the fathers of the Church. The chapel is of bronze, supported on pillars, beneath which are deposited the remains of the saint in a chest of oak. It is deemed a masterpiece.

The Rose Wreath and Cross, of Veit Stoss, from the Church of St. Lawrence, at Nuremberg, is reproduced in the German Mediæval Court. The city is divided by a small stream called the Pegnitz. On the northern bank stands St. Sebald's, on the southern the Church of St. Lawrence. It was founded in 1274, and is the largest and finest ecclesiastical structure in Nuremberg. The western portal, surmounted by a magnificent rose window, is remarkable for its rich decorations. Nuremberg was famous for painting in glass, and this art is displayed to great advantage in St. Lawrence's. Here Adam Krafft constructed the elegant and



CHRIST BEARING HIS CROSS.

ment, looking towards the Byzantine Court, exhibits the doorway of the monastery at Denkendorf, in Wirtemberg. On the right is a panel, representing the Coronation of the Virgin, who kneels at the feet of God the Father and of God the Son; a virgin and child; an episcopal monument from Munich; a great door from the Frauenkirche of Nuremberg; statues of St. Peter and St. Paul, from the church of Langen, in Darmstadt, and various other subjects in panel from the New Testament; itinerant Jongleurs from the Town-Hall of Munich, and different specimens of German Gothic ornament, principally from Cologne Cathedral.

The free and imperial city of Nuremberg held a high position in Germany during the middle ages, and reached the zenith of prosperity during the fifteenth and sixteenth centuries: there the German emperors resided, and there diets were held. It was one of the centres of manufactures, and a famous mart of trade. Opulent merchants encouraged the fine arts, and cherished the genius of Albert Durer, Peter Vischer, Adam Krafft, Veit Stoss, and of other celebrities. Its government was aristocratic, in some respects resembling that of Venice. One of the most beautiful structures in Nuremberg is the fine Gothic church dedicated to St. Sebaldus. In this building Adam Krafft displayed his talents as a sculptor, where he executed a representation of the Last Supper. In this work he departed from the usual practice, as the table is circular. As a specimen of his style, we have engraved his "Christ bearing

delicate repository for the sacred wafer, celebrated for the minute delicacy of the carving; and here also Veit Stoss executed in wood the Salutation of the Virgin by the Angel.

In the Town-Hall are fine specimens of the oil-painting of Albert Durer, particularly the "Triumph of the Emperor Maximilian," and it may here be remarked that the house of the artist is still preserved, and occupied by a society of artists, as is also the dwelling of Hans Sachs, the satirical cobbler, who composed a vast number of minor poems attacking the Roman Catholics at the commencement of the Reformation.

To the Cathedral of Ulm, Adam Krafft contributed a "Sacraments-häuschen," similar to that at St. Lawrence's, at Nuremberg, but loftier—that at the latter place being 64 feet high, and at the former 90 feet. The Minster at Ulm is a very fine specimen of Gothic architecture, commenced in 1377, and finished in 1488, entirely at the expense of the citizens. The chief portal is much admired, consisting of three pointed arches, recessed within pillars. The tower is 377 feet high, though had the original plan of the architect been carried out, the elevation would have been 491 feet, or rather higher than the spire of Strasburg, which is 474 feet above the pavement. However, the body of Ulm Minster exceeds in dimensions those of Strasburg and St. Stephen's, at Vienna, being 485 feet long, 200 wide, and 144 feet high. It has five aisles, and several windows in the choir are of richly painted glass.

Although Strasburg now belongs to France, having been attacked and retained by Louis XIV., in 1581, in time of peace, it was before that date an imperial city of the German empire, and therefore falls within this department of the Sydenham Palace Expositor. Its cathedral was designed by Erwin of Steinbach, who died in 1318, when the work was only half finished. The tower, commenced in 1277, was completed in 1439. It contains a circular window of the extraordinary diameter of 48 feet. This building has been the theme of universal eulogium. Mr. Hope eulogises "the gigantic mass, over the solid part of which is thrown a netting of detached arcades and pillars, which, notwithstanding their delicacy, from the hardness and excellent preservation of the stone, are so true and sharp as to look like a veil of the finest cast iron." Mr. Whewell, in a similar strain, observes that "The building looks as though it were placed behind a rich open screen, or in a case of woven stone. The effect of the combination is very gorgeous, but with a sacrifice of distinctness from the multiplicity and intersections of the lines."

The Cathedral of St. Stephen, at Vienna, is another noble specimen of German Art in the mediæval age, completed in 1480. Its length is 350 feet, and its greatest breadth 220. Some rich tracery decorates the exterior. The general view of the interior has been pronounced gloomy; but different critics view objects with different eyes. The pillars are no doubt very massive, but rich sculpture and painted rose windows afford relief and light. It contains a splendid monument of the Emperor Frederick III. in marble. The style of architecture is florid Gothic; but the roof does not accord with that style, being covered with glazed tiles of various colours, laid in mosaic patterns, representing on a gigantic scale the imperial eagle of Austria. Of course this roof is modern. The original structure was commenced by Duke Henry II. in 1144, the architect

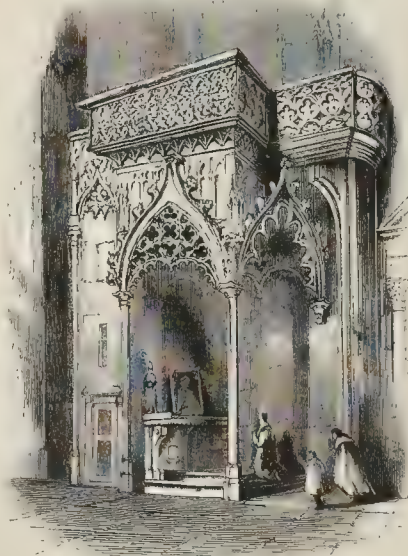
but talented mason, named Wenzla, but he only lived to carry the southern tower to two-thirds of its intended height. It is 465 feet high, and was finished in 1433. The foundation of the second tower was laid in 1450, but the work was stopped in 1516. According to Mr. Edward P. Thompson, "The building is in the form of a Latin cross, measuring in length 395, and in width 145 feet at the chancel, and 224 at the naves; the former being 164, and the latter 188 feet high. The old records state that 2900 barks of timber were used in the construction of the roof alone. Of the five doors, that at the northern extremity, which is flanked by two octangular towers 204 feet high, is the most remarkable. It is styled the giant door, and is a masterpiece of the old Gothic style. The interior, divided by two rows of elegant Gothic columns, richly carved and decorated, consists, besides the chancel, of six chapels, two sacristies, four choirs, three oratories, and forty altars. There are many objects of interest within the walls, among which are the vaults in which the former sovereigns of Austria are interred; the monument of Duke Rudolph and his wife (the daughter of the Emperor Charles IV.), and the sarcophagus of the Emperor Frederick III. This last elaborate work was executed by the celebrated Nicolas Lerch of Strasburg, who finished the cover in the lifetime of the emperor; but the whole, containing two hundred figures, was not completed till the year 1513, at the cost of 40,000 ducats. There are also the monuments of the Field-marshal Prince Eugene of Savoy, and of the Cardinal-archbishop the Count of Kolloritsch."

To the illustrations of the Sydenham Palace the Cathedral of Augsburg contributes a large figure of the Virgin, taken from the central pier of the principal doorway, but it is in no respect remarkable. This cathedral is an irregular building, having brass doors to an ornamental portal, and covered with bas-reliefs in the Byzantine style. Augsburg is not very conspicuous for works of art, or rare antiquities, though formerly the outer walls of the houses were covered with frescoes of scriptural subjects and legends of saints, but it is, and ever will remain, celebrated as the city in which was proclaimed the famous declaration of the Protestants known as the "Confession of Augsburg," presented to the Emperor Charles V., in 1530. Here also resided the princely merchant Antony, Count Fugger, whose family received so many patents of nobility, that in its various branches it numbered forty-seven counts and countesses of the empire, the original ancestor being a simple weaver, named Conrad Fugger. This family supplied immense sums of money to the Emperors Maximilian and Charles V., and enjoyed the rare privilege of coining money. Augsburg gave to the arts Hans Holbein the elder, whose son, the well-known painter, lived and died in England.

The Fools, or Mummers, over the entrance to the Nave, are taken from the Town-Hall at Munich. They were strolling-players, descendants of the itinerant Jongleurs, much esteemed in the eleventh and twelfth centuries; but their successors degenerated into mere mountebanks. The figures in the Sydenham Palace are remarkable for their fantastic attitudes, and the variety of expression thrown into their countenances. One of them represents a negro. As one of the seats of art, Munich was by no means remarkable in earlier times, though it is now the worthy rival of the most famous capitals in Europe, owing to the taste, energy, and liberality of Louis, King of Bavaria; but it does not fall within the scope of this work to notice his meritorious labours.

Mayence Cathedral contributes the monument of Archbishop Peter von Aspett, round which are grouped smaller figures of the Emperor Henry VII., King John of Bohemia, and Louis of Bavaria, who were all crowned by that archbishop. From the same cathedral is taken the monument of Archbishop Siegfried von Epstein; and Prague furnishes the equestrian statue of St. George, which stands in the cathedral square of that city.

The elevation of the French and Italian Mediæval Court towards the English Mediæval Court is composed of Bishop West's doorway, arches from the choir of Notre Dame, and canopies from Chartres Cathedral. In this compartment are fine specimens of the styles of Nino and Giovanni Pisano, and of Andrea Orcagna, the Italian artists of whom mention has been made in our description of the Renaissance Court.



SHRINE IN ST. STEPHEN'S CATHEDRAL.

being Octavian Falkner of Cracow, and was consecrated by Reimbert, Bishop of Passau, in 1147; but it was Rudolph IV. who laid the foundation of its present grandeur, in 1359, by ordering the construction of two great towers, which he entrusted to an obscure

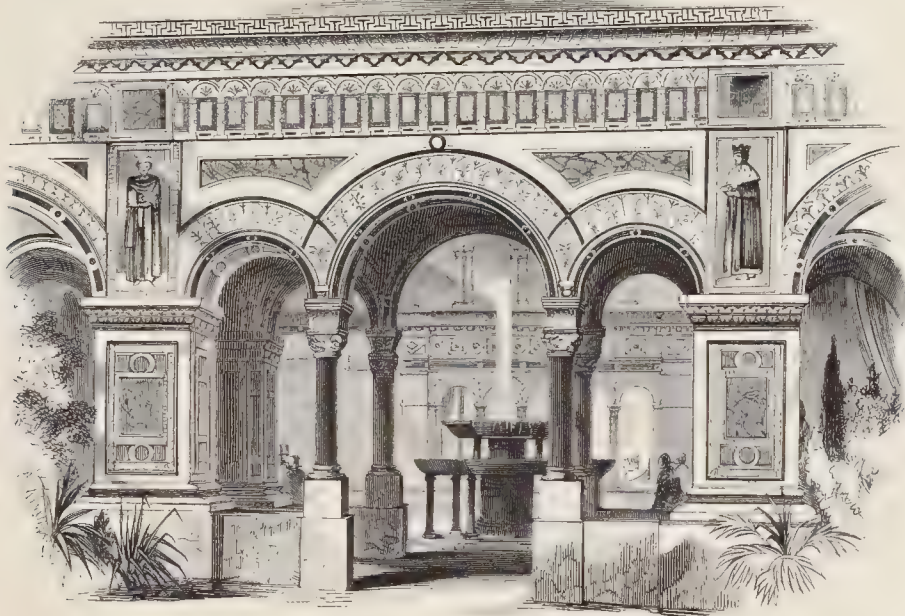
THE BYZANTINE COURT.

THE interval which elapsed between the decline of Roman architecture, and the introduction of Pointed architecture, is always treated as a transition period—during which various styles arose in different countries, known as the Byzantine, Romanesque, Lombard, Saracenic, Moorish, and Mohammedan. The history of Byzantine art is usually divided into three epochs:—the first dates from the time of Constantine, and closes in the middle of the sixth century; the second ranges from the reign of Justinian to the eleventh century, to which period most of the existing Byzantine monuments belong—those of the former period have perished with rare exceptions; the third commences with the eleventh century, and terminates with the final conquest of Greece by the Turks in the fifteenth.

The Emperor Constantine, at his conversion to Christianity, ruled both the east and west, but fixed his imperial residence at Byzantium, in the year 328—there founding what may be termed a new city, called after him, Constantinople. There was established that new empire, variously styled by historians the Eastern, the Greek, the Lower, the Byzantine, and the Constantinopolitan Empire. Many circum-

a school of learning, a circus, two theatres, eight public and one hundred and fifty-three private baths, fifty-two porticoes, five granaries, eight aqueducts, or reservoirs of water, four spacious halls for the meetings of the senate, or courts of justice, fourteen churches, fourteen palaces, and four thousand three hundred and eighty-eight houses, which, for their size or beauty, deserved to be distinguished from the multitude of plebeian institutions."

In the teaching of Christianity, at Rome and at Constantinople, some doctrinal differences existed, from which arose two churches—the one called the Latin, the other the Greek Church. The symbol of both was the sign of the cross; but it differed in form when placed over ecclesiastical buildings, and became a distinctive feature in the architecture of the two churches. The Latin cross was composed of four unequal arms; the four arms of the Greek cross were all equal. At Rome, in circular or domed edifices, the dome rested on circular walls; the Byzantine cupola was supported on pillars. Another characteristic feature in the Byzantine style was the art of vaulting—that is, the mode of covering a building with a concave



FAÇADE OF THE BYZANTINE COURT.

stances appeared to have operated on the mind of Constantine when he resolved on quitting Rome, and building his new capital on the shores of the Bosphorus. "During the late operations of the war against Licinius," observes Mr. Gibbon, "he had sufficient opportunity to contemplate, both as a soldier and as a statesman, the incomparable position of Byzantium, and to observe how strongly it was guarded by nature against a hostile attack, while it was accessible on every side to the benefits of commercial enterprise." The ambition of founding a city to perpetuate the glory of his own name must have powerfully influenced his decision, and he might have desired to remove himself from the banks of the Tiber, where paganism had a vast majority of secret yet earnest friends. His choice being made, he lavished the wealth his power commanded on adorning the new city; and it is recorded that he appropriated £2,500,000 for the construction of the walls, the porticoes, and the temples. Greece and Asia were despoiled of their most valuable ornaments; and the historian relates that a "particular description, composed about a century after its foundation, enumerates a capitol,

instead of a flat ceiling. The Byzantine architects placed in front of their churches a square court, having an open space, surrounded by a colonnade, the colonnade having a domed instead of a flat roof. "Arches rising over arches, and cupolas over cupolas," says Mr. Hope, "we may say that all which in the temples of Athens had been straight, and angular, and square, in the churches of Constantinople became curved and rounded, concave within, and convex without; so that after the Romans had begun by depriving the architecture of the prior Greeks of consistency, the Christian Greeks themselves obliterated every mark of the architecture of their heathen ancestors still retained by the Romans, and made the ancient Grecian architecture owe its final annihilation to the same nation to whom it had been indebted for its first birth."

Constantine built a cathedral at Constantinople, to which was given the name *Sancta Sophia*, or Holy Wisdom, which was destroyed by fire in the year 404, and rebuilt by Theodosius. It underwent the same fate a second time. The temple or cathedral which now stands at Constantinople, though turned into a mosque

for Mohammedan uses, was constructed by the Emperor Justinian. It is the finest existing specimen of Byzantine architecture, and the following description of it is by the masterly hand of Gibbon:—"The principal church, which was dedicated by the founder of Constantinople to St. Sophia, or the Eternal Wisdom, had been twice destroyed by fire—after the exile of John Chrysostom, and during the *nika* of the blue and green factions. No sooner did the tumult subside, than the Christian populace deplored their sacrilegious rashness; but they might have rejoiced in the calamity, had they foreseen the glory of the new temple, which, at the end of forty days, was strenuously undertaken by the piety of Justinian. The ruins were cleared away; a more spacious plan was described, and, as it required the consent of some proprietors of ground, they obtained the most exorbitant terms from the eager desires and timorous conscience of the monarch. Anthemius formed the design; and his genius directed the hands of ten thousand workmen, whose payment in pieces of fine silver was never delayed beyond the evening. The emperor himself, clad in a linen tunic, surveyed each day their rapid progress, and encouraged their diligence by his familiarity, his zeal, and his rewards. The new Cathedral of St. Sophia was consecrated by the patriarch, five years eleven months and ten days from the first foundation; and in the midst of the solemn festival, Justinian exclaimed, with devout vanity, 'Glory be to God, who hath thought me worthy to accomplish so great a work: I have vanquished thee, O Solomon!' But the pride of the Roman Solomon, before twenty years had elapsed, was humbled by an earthquake, which overthrew the eastern part of the dome. Its splendour was again restored by the perseverance of the same prince; and, in the thirty-sixth year of his reign, Justinian celebrated the second dedication of a temple, which remains, after twelve centuries, a stately monument of his fame. The architecture of St. Sophia, which is now converted into the principal mosque, has been imitated by the Turkish sultans; and that venerable pile continues to excite the fond admiration of the Greeks, and the more rational curiosity of European travellers. The eye of the spectator is disappointed by an irregular prospect of half domes and shelving roofs; the western front, the principal approach, is destitute of simplicity and magnificence; and the scale of dimensions has been much surpassed by many of the Latin cathedrals. But the architect who first erected an aerial cupola is entitled to the praise of bold design and skilful execution. The dome of St. Sophia, illuminated by four and twenty windows, is formed with so small a curve, that the depth is equal to one sixth of the diameter; the measure of that diameter is 115 feet, and a lofty centre, where the crescent has supplanted the cross, rises to the perpendicular height of 180 feet above the pavement. The circle which encompasses the dome reposes lightly on four strong arches, and their weight is firmly supported by four massy pillars, whose strength is assisted on the northern and southern sides by four columns of Egyptian granite. A Greek cross, inscribed in a quadrangle, represents the form of the edifice; the exact breadth is 243 feet, and 269 may be assigned for the extreme length from the sanctuary in the east to the nine western doors which open in the vestibule, and from thence into the *narthex*, or exterior portico. That portico was the humble station of the penitents. The nave or body of the church was filled by the congregation of the faithful; but the two sexes were prudently distinguished, and the upper and lower galleries were allotted for the more private devotion of the women. Beyond the northern and southern piles a balustrade, terminated on either side by the thrones of the emperor and patriarch, divided the nave from the choir; and the space, as far as the steps of the altar, was occupied by the clergy and singers. The altar itself, a name which insensibly became familiar to Christian ears, was placed in the eastern recess, artificially built in the form of a demi-cylinder; and this sanctuary communicated by several doors with a sacristy, the vestry, the baptistry, and the contiguous buildings, subservient either to the pomp of worship, or the private use of the ecclesiastical ministers. The memory of past calamities inspired Justinian with a wise resolution, that no wood, except for the doors, should be admitted into the new edifice; and the choice of the materials was applied to the strength, the lightness, or the splendour of the respective parts. The solid piles, which sustained the cupola, were composed of huge blocks of freestone, hewn into squares and triangles, fortified by circles of iron, and firmly cemented by the infusion of lead and quicklime; but the weight of the cupola was diminished by the levity of its substance, which consists either of

pumice-stone, that floats in water, or of bricks from the island of Rhodes, five times less ponderous than the ordinary sort. The whole frame of the edifice was constructed of brick, but those base materials were concealed by a crust of marble; and the inside of St. Sophia, the cupola, the two larger, and the six smaller semi-domes, the walls, the hundred columns, and the pavement, delight even the eyes of barbarians with a rich and variegated picture. A poet who beheld the primitive lustre of St. Sophia, enumerates the colours, the shades, and the spots of ten or twelve marbles, jaspers, and porphyries, which nature had profusely diversified, and which were blended and contrasted as it were by a skilful painter. The triumph of Christ was adorned with the last spoils of paganism; but the greater part of these costly stones was extracted from the quarries of Asia Minor, the isles and continent of Greece, Egypt, Africa, and Gaul. Eight columns of porphyry, which Aurelian had placed in the Temple of the Sun, were offered by the piety of a Roman matron; eight others of green marble were presented by the ambitious zeal of the magistrates of Ephesus; both are admirable for their size and beauty; but every order of architecture disclaims their fantastic capitals. A variety of ornaments and figures was curiously expressed in mosaic; and the images of Christ, of the Virgin, of saints, and of angels, which have been defaced by Turkish fanaticism, were dangerously exposed to the superstition of the Greeks. According to the sanctity of each object, the precious metals were distributed in thin leaves or in solid masses. The balustrade of the choir, the capitals of the pillars, the ornaments of the doors and galleries, were of gilt bronze; the spectator was dazzled by the glittering aspect of the cupola; the sanctuary contained 40,000 pounds weight of silver, and the holy vases and vestments of the altar were of the purest gold, enriched with inestimable gems. Before the structure of the church had risen two cubits above the ground, £45,200 were already consumed, and the whole expense amounted to £320,000; each reader, according to the measure of his belief, may estimate their value either in gold or silver; but the sum of a million sterling is the result of the lowest computation."

In our description of the Renaissance Court we noticed at some length the famous cupola erected by Brunelleschi over the Church of Santa Maria del Fiore, at Florence; but, great as were his merits, he has no title to the invention of the art of their construction, which is due to Anthemius and Isidorus, the architects of Justinian. It is from their epoch that we must date the origin of the cupola resting upon the four pillars of a square, which square is gradually formed into a circle by pendentines, or those parts in the angles between the arches of the nave which spring from a point, and gradually advance in a concave direction to receive the circular entablature of the cupola—an idea suggested by the figure of the cross represented in the plans of all Christian churches. St. Sophia, in whole or in part, has influenced the structure of churches in all parts of Europe. The Venetians took it for their model in building St. Mark, at Venice, in the year 973, and the Pisans in planning their cathedral.

The various stones and marbles used in the construction of St. Sophia have been diligently recorded. The Carystian was pale with iron veins; the Phrygian was of two sorts, both of a rosy hue, but the one had a white, the other a purple shade, with silver flowers; the porphyry of Egypt, with small stars; the green marble of Laconia; the Carian from Mount Iassus, with oblique veins, white and red; the Lydian, pale, with a red flower; the African or Mauritanian, of a gold or saffron hue; the Celtic, black with white veins; the Bosphoric, white with black edges; the Proconnesian, which formed the pavement.

At the conquest of Constantinople, St. Sophia was turned into a Turkish mosque, the crosses removed, and the images and mosaics taken from the walls, which were restored to a state of naked simplicity. The imam preached in it, and Mohammed II. uttered thanksgiving to the prophet for his victory. "In the new character of a mosque," says Gibbon, "the Cathedral of St. Sophia was endowed with an ample revenue, crowned with lofty minarets, and surrounded with groves and fountains for the devotion and refreshment of the Moslems. The same model was imitated in the *jams*, or royal mosques; and the first of these was built by Mohammed himself on the ruins of the Church of the Holy Apostles, and the tombs of the Greek emperors."

The Mohammedan conqueror acted in a spirit of liberality and tolerance to the followers of the Greek Church which did him high honour, and palliated in some degree other enormities which he

committed. When Constantinople was taken by assault, the patriarch was dead, no successor having been appointed during the siege. The sultan ordered a new election, in which he commanded that all the usual forms and ceremonies of the Byzantine Church should be scrupulously observed. Accordingly, the clergy and laity were convened, and conferred the patriarchate on George Scholarius, otherwise called Genadius, with the same rights that had been used from the foundation of the Byzantine Empire. The patriarchs had received their investiture from the emperors; Genadius received his from the hands of the sultan, who invited him to a sumptuous banquet, and honoured him by a magnificent reception. When he was about to depart, the sultan delivered into his hands the jewelled crozier, symbol of his ecclesiastical office, and said, "Be thou patriarch, and may heaven protect you! Rely upon my friendship in all circumstances, and enjoy all the rights and all the privileges enjoyed by your predecessors." The churches of Constantinople were equally divided between the Christians and Mohammedans, and the limits assigned to the classes distinctly marked. In this manner, in the year 1453, the Greek Church at Constantinople was placed under the immediate protection of the sultans. But the equitable arrangements made by Mohammed II. were infringed by his grandson, Selim.

Byzantine architecture penetrated into Russia at an early period. Igor, the son of Rourik, who founded the Russian empire, pursued the policy of his guardian, Oleg, in making war against the Greeks, who, in the year 904, arrived under the walls of Constantinople with 80,000 combatants. Leo the Philosopher, who then reigned, purchased peace at a high cost from these ferocious invaders. The more formidable expedition of Igor is said to have been composed of 10,000 barks, each containing 40 men, so that his army must have consisted of 400,000 combatants. His atrocities were most inhuman—Christian priests being his favourite victims. His widow, Olga, was of a gentle temper. She took the reins of government at his death, as mother of his infant son, and travelled to Constantinople, to be initiated into the precepts and mysteries of Christianity; and, on embracing that faith, took the name of Helena. However, the conversion of this princess did not confirm the triumph of Christianity in her dominions, as her example was not followed by her son, Sviatoslof, or the nobles. On the death of Sviatoslof, his children divided among them the dominions of their father, and then made war on each other. Jaropalk assassinated Oleg, and Vladimir murdered Jaropalk. This surviving son united in his own hand the different countries subjected by his father. It is this Vladimir who is styled the *Great* in the history of Russia, and also the *Saint*, because he is the first sovereign of that empire who adopted and solidly established the Christian faith in his kingdom—an enterprise in which his grandmother, Olga, failed.

There are three distinct epochs in the history of the Russo-Greek Church:—1st. It was ruled by the patriarchs of Constantinople, who nominated the metropolitans of Kiev, Vladimir, and Moscow. 2nd. In 1089 the metropolitan was nominated by the czar, but he remained perfectly independent of temporal power. 3rd. In 1723, the czar, Peter the Great, became supreme head of church and state. It was in the first epoch that Byzantine architecture dominated. In the second, it was combined with other styles. In the third, the Italian was introduced.

The city of Kiev, or Kiev, is one of the most ancient cradles of Russian sovereignty, contains the oldest church in the kingdom, called St. Sophia, and though it is not, as some have erroneously asserted, built strictly after the model of Justinian's cathedral, at Constantinople, yet no doubts can exist as to its having been constructed by Greek architects, as it bears on the interior many traces of Byzantine architecture. Mr. James, when travelling in Russia, was forcibly struck with the oriental features of many of the buildings, and on the subject generally refers to the discourses of Sir William Jones, published in the *Asiatic Researches*. As connecting the primitive Russians with the Hindus, he observes that, at the remains of the monastic establishment of the Tartars, at Semipalatnaia, in the province of Tobolsk, the chief books discovered were in the Mongolese and Tangout languages. It is very certain that they who wrote the books influenced the style of architecture, and hence the mixture of the Hindoo with the Byzantine. The Gostinnoi Dvor, or square market-place, seen in every town of old Russia, is constructed with double arcades, one above the other, as in an eastern bazaar; the thick baluster column, the pagoda fashion of the old steeples, the façades adorned with painted and glazed

tiles, the bulging form of the cupola, and its situation in the centre of the building, surrounded by four smaller ones—all peculiarities common throughout the Mohammedan countries of the East, will sufficiently prove from what quarter this people must have drawn their ideas of architecture.

"It might be urged," says Mr. James, "that these fashions were introduced by the Tartars during their invasion, but it appears, from examples now existing, that this was not the first time they borrowed from the eastern nations. The older churches of Russia afford so many points of resemblance to the sculpture and buildings of the Hindus, that we can scarce entertain a doubt of their having acquired their taste from that people. Nor can this be held extraordinary; we know that the only places in the adjoining districts of Tartary where science and letters were cultivated were settlements of the Hindus, who supplied the hordes with all the learning and ingenuity of which we can discover any traces. The Tartar remains at Bolga, as well as those at Kasan, are built in the Hindoo style; there are also many buildings in the Kremlin, at Moscow, and a church in the southern quarter of the Semlianiogorod, with many others, where certain similarities may be traced. Again, the pagoda fashion of the old wooden churches throughout the empire, and the baluster-shaped columns which are often to be met with, are striking examples of this style. When treating of this subject, it is impossible to avoid remarking that certain points of resemblance between this style and that of the European pointed architecture are to be observed here, as well as in that of Hindostan, as exhibited by Mr. Daniell; we trace it in the high pointed, gable-headed windows, in the contrasted arch, in the long slender shafts of pillars in relief, in the broad astragals that intersect their length, and in the minutiae of their ornamental carved work; and one can imagine we see, though in a different stage of perfection, the same taste in building which has since made so great progress in Europe. Perhaps it will hereafter appear that the same eastern or primitive style, which we trace under similar features in the oldest monuments of the world, at Persepolis, in Egypt, and Hindostan, was in fact the prototype of the two chief prevalent styles of the present day, of both the Grecian and the pointed architecture, since we may discover in its lineaments strong features, not only of the one, but of the other."^{*}

The decorations which prevailed in the Byzantine churches, images, and paintings, prior to the reign of the iconoclastic emperors, were not permitted to the same extent by the Russo-Greek Church. This Church does indeed recognise prayer to the saints, and the efficacy of their intercession; but, with special exemptions, it forbids graven images. Paintings, however, of the Virgin Mary, copied from the original by St. Luke, which tradition declares to be genuine, and the ancient image of Christ imprinted on the handkerchief of *Sancta Veronica*, which the Greek Church pronounces to be the true representative of the Saviour, "not produced by the hand of man," are orthodox objects of adoration. On this subject the difference between the Greek and Latin Church is clearly defined, as the former only admits those paintings which it believes to be of holy or miraculous origin, rejecting all known to be productions of human art. In 1699, the Czar Alexis announced by ukase that "the sacred images of God were, according to the tradition of the holy fathers, under the inspiration of God, and they were accepted according to the invariable usages of the holy Greek Church." This early strictness has been relaxed, excepting in the churches of the Staroverzi, where none but old images are allowed. In 1674, the Patriarch Joachim severely denounced all innovations, and interdicted "printing the countenances of the saints on paper, and the sale of such as were imported from Germany," observing "that many make these images in a perverse fashion; the Lutherans and Calvinists represent them with the features of persons now living in their own country, and in German costume, instead of representing them according to the antique models which exist in the orthodox churches." Kosegarten states that the village of Kholui, in the government of Vladimir, is especially devoted to the manufacture of orthodox images, which is the exclusive occupation of its 900 inhabitants; and Haxthausen observes that these artificers possess approved models of the separate parts of the human countenance—as the eyes, nose, mouth, chin—so that if an image is

^{*} Journal of a Tour in Germany, Sweden, Russia, and Poland, during the years 1813 and 1814. By J. T. James, student of Christ Church, Oxford. London: John Murray.

accidentally injured, the defaced or broken part is readily restored. These images, he says, are sold all over Russia, and even beyond its limits, in oriental and Slavonic countries, and may be seen in the hands of the Croats on the military frontiers of Austria. As they are considered sacred, they are said not to be sold as merchandise, but exchanged. These religious feelings account for the difference in the interiors of the Russian and Byzantine churches.

After the fall of Constantinople, Italian architects were employed in Russia, or natives who adopted the Italian style, or engrafted it on that of the Byzantine. As a specimen of this mixed style, we may refer to the Cathedral or Church of the Holy Virgin of Casan, at St. Petersburg. The name of the architect was Woronitchki, a slave, the property of Count Strogonoff, brought up under the patronage of his master in the Imperial Academy, where his remarkable talents were soon perceived and appreciated. The cathedral cost 15,000,000 rubles, and fifteen years elapsed before it was completed. It is described by Mr. James. The plan is laid in the form of a cross, with a cupola in the centre; each arm of the cross terminates with a Corinthian portico, and that in front is received into a grand semicircular colonnade, four columns in depth; the area of the crescent was intended to have been ornamented with the statues of St. Peter and Paul, raised on gigantic blocks of solid granite, ten or twelve feet high; one of them, however, was unfortunately sunk in crossing the Neva, and this part of the design remained unfinished. In point of architecture, the composition of the building is not quite harmonious throughout; and the dome is so contracted in its dimensions, as to give, in some points of view, an air of insignificance to the whole. The approach to it is noble in effect; in each line, as the eye is directed, it is met by a forest of lofty columns, which form, at every step, combinations of the most classical variety. The interior is magnificent. The columns of the aisles are of purple granite, highly polished; their capitals of brass and gold. Rich paintings line the walls; and a dim, mysterious gloom pervades the whole fabric.

Byzantine architecture penetrated into Italy—particularly into Ravenna and Venice. After the great victory of Pollentia, gained by Stilicho over Alaric and the Goths, the Emperor Honorius, fearing another invasion of the barbarians, determined to secure his person from seizure, and selected Ravenna, on the coast of the Adriatic, where Augustus had constructed a spacious harbour. Under Justinian, Ravenna was raised to the dignity of an exarchate; and the first exarch was Narses, the successful general of the eastern emperor. Rome was then degraded to the second rank among Italian cities, the exarch extending jurisdiction over it. It was under these altered circumstances that Greek architects from Constantinople enriched Ravenna with buildings in the Byzantine style; and as infant Venice was placed under the exarchs, there also the same style of architecture prevailed. At Ravenna, Justinian built the Church of San Vitale, after the model of Sancta Sophia, but with some variations. It is circular without, octagonal within, contains small arches on pillars within larger arches, and its walls are coated with mosaic.

San Marco, or St. Mark's, at Venice, is also built on Byzantine designs. Of this famed edifice, Mr. Gally Knight gives the following description:—"The plan of St. Mark's, like that of Sancta Sophia, is a great cross, with the addition of spacious porticoes. The centre of the building is covered with a dome; and over the centre of each of the arms of the cross rises a smaller cupola. All the remaining parts of the building are covered with vaults, in constructing which the Greeks had become expert, and which are much to be preferred to the wooden roofs of the old basilicas. Colonnades and round arches separate the nave from the aisles in each of the four compartments, and support galleries above. The capitals of the pillars are of exquisite foliage in some cases, as if blown about by the winds, and are free from the imagery which at that time abounded in other churches of Italy. It is computed that in the decoration of this building, without and within, about 500 pillars are employed. The pillars are all of marble, and were chiefly brought from Greece and other parts of the Levant. While St. Mark's was building, every vessel that cleared out of Venice for the East was obliged to bring back pillars or marbles for the work in which the republic took so general an interest. The defect of the interior of St. Mark's is, that it is not sufficiently light. The windows are few in proportion to the size of the building. Rich, therefore, as the interior is, it is gloomy to a fault, in spite of the brilliant rays of a southern sun." Over the central portal of the

vestibule stand the celebrated bronze horses taken from the Hippodrome of Constantinople in the fourth Crusade, being part of the share of plunder acquired by the Venetians. Two rows of columns in the façade, deeply engraven with Armenian and Syriac inscriptions, show that they have been taken from other buildings. Byzantine architecture was also introduced into Milan, for on the site where the existing cathedral or *duomo* stands, Queen Theodolinda, daughter of Garibold, King of the Bavarians, and wife of Anstasius, King of the Lombards, erected, in 595, a church in honour of John the Baptist.

Mohammedan and Moorish architecture is also strongly associated with the Byzantine style, which travelled into Asia Minor, Armenia, and the Caucasian provinces; while among the Slavonic, Arab, and Greek races, it was the primary element in art. It is probable that, before the time of Mohammed, the Arabians imitated the architecture of ancient Egypt. The Kaaba, at Mecca, which contains the tomb of the prophet, is the only relic of the earliest style; and it has been so frequently changed or modified, that it is difficult to distinguish the oldest from subsequent portions. The Kaaba was so called from its form, the word signifying *square*. The Turkish traditions pretend that the original edifice was constructed by Abraham and Ishmael; while some give the honour to Seth, who used stone and clay. After the Deluge, these later authorities state that Abraham and Ishmael rebuilt the Temple on its first site. It is thus described in Ockley's *History of the Saracens*:—"The Kaaba, which has been several times rebuilt or repaired, is a square stone building, the length whereof, from north to south, is twenty-four cubits, the breadth, from east to west, twenty-three, and the height twenty-seven cubits. The door, which is on the east side of the threshold, rises four cubits above the ground, so that, there being no steps adjoining to it, they who come to worship may touch the threshold with their foreheads, or kiss it (there are movable steps to be used when the building is to be cleaned, or the lamps lighted). The black stone, which the Mohammedans hold in great reverence, and believe to be one of the stones of Paradise, which fell down with Adam from heaven, is a small stone set in silver, and fixed in the south-east corner of the Kaaba, about four feet from the ground. It is said to be white within, but to have been turned black on the outside by the sins of the people, or more probably by the kisses of the pilgrims. Upon the ground, on the north side of the Kaaba, there is a stone called the Sepulchre of Ishmael. There is also another stone, called the Station of Abraham, which they say, being used by him for a scaffold, rose higher with him as the walls of the building rose; and that, after he had done building, he stood upon it and prayed, and left on it the prints of his feet. Round three sides of the Kaaba, and at no great distance from it, stands a row of pillars, which are joined at the bottom by a low balustrade, and at the top by bars of silver. Without this enclosure are buildings used for oratories by the different sects of Mohammedans; there also is the treasury, and a small edifice raised over the sacred well, *Zemzem*. All these buildings are enclosed at a considerable distance by a magnificent colonnade, surmounted with small cupolas, and at the four corners there are as many steeples adorned like cupolas, with gilded spires and crescents; between the pillars of both enclosures hang a number of lamps, which are constantly lighted up at night. The Kaaba is supported by pillars of aloë-wood, between which hang silver lamps, and a spout of gold carries off the rain-water from the roof. The walls on the outside are hung with a rich covering of black damask, adorned with a band of gold, which is changed every year at the expense of the Turkish emperor. The Kaaba is properly the temple; but the whole territory of Mecca is held sacred, and distinguished by small turrets, some at seven, and others at ten miles distance from the city. Within these precincts it is not lawful to attack an enemy, or even hunt or fowl."

Before Persia received the law and the religion of its Mohammedan conquerors, it is supposed to have imparted some of its architectural style to the Byzantine buildings; but after the conquest it took the model of its mosques from Constantinople. In the description of the Alhambra we have seen the relations between the Moorish and Byzantine styles. The same striking features are recognised at Bagdad and Cairo, at Mecca and Jerusalem, at the latter of which places the Caliph Omar built his splendid mosque on the site of the ancient temple, and at Cordova, in Spain. The Moguls carried the religion of Mohammed into India, and with it the form of architecture used in the sacred edifices. On this subject Mr. Hope has made the following remarks:—"While in some of

the various and distant countries here named we observe, previous to the adoption of Islamism, the slightest approach to those inventions, the pride and the stay of architecture—the arch and the cupola—in all of them alike, in the very first settling in them of Mohammedans, we see these noble features immediately appearing, from the application of Greek skill, in the full maturity of form they had attained among themselves. Indeed, in every Moslem dominion which continued to flourish during a sufficient period, we even see the arch and the vault keep pace in their further developments and changes with those which they experienced at the fountain head—as the pointed, the depressed, the scolloped, nay, the horse-shoe arch, successively, gained favour at Constantinople and the rest of the Greek Empire; and thence also in the cities of Italy, connected with that empire by trade or by vassalage, each successively prevailed. In like manner, in the various regions under Mohammedan rule, and throughout India, Persia, Syria, Egypt, Africa, and Spain; at Agra, at Ispahan, at Damascus, at Cairo, at Tripoli, at Tunis, at Fez, and at Granada; in mosques and in medrasses, in palaces and in pavilions, in bazaars and in bridges, in the Sepulchre of Mohammed,

and the Oder, when first mentioned in history; but in the reign of Justinian they passed the Danube as the allies of that emperor. After a contest of thirty years, they extirpated the Gepidæ, a nation of warriors. Alboin, the youthful prince of the Lombards, then turning his eyes to the Po and the Tiber, determined to effect conquests in Italy, in which bold attempt he succeeded; and from his followers the fertile district of the Milanese, and the adjoining territory took the name of Lombardy. Alboin fixed his royal residence not at Milan, but at Pavia, which became the capital of his new kingdom; and during a period of two hundred years, Italy was unequally divided between his successors and the exarchs of Ravenna. "From Pavia, the royal seat," says Gibbon, "the (Lombard) kingdom was extended to the east, the north, and the west, as far as the confines of the Avars, the Bavarians, and the Franks of Austrasia and Burgundy. In the language of modern geography, it is now represented by the *terra firma* of the Venetian republic, Tyrol, the Milanese, Piedmont, the coast of Genoa, Mantua, Parma, and Modena, the Grand Duchy of Tuscany, and a large portion of the ecclesiastical state from Perugia to the Adriatic." Under Desi-



EXTERIOR OF THE CHURCH OF THE HOLY SEPULCHRE.

at Mecca, as in the Tomb of the Holy Virgin, at Jerusalem, or the Hall of Saladin, at Cairo, we already find the arch, not only with the double curve, forming the ogive sharpness in the centre, but the low-spreading at the sides, which we consider, in the north of Europe, as the last modification of the Pointed style. This ogive arch seems even early to have become, and lately to have remained, with the Mohammedans of India, a favourite almost exclusive. In Spain, on the other hand, the horse-shoe arch became the universal favourite, was employed in all the later Moorish buildings, and from these again became imitated, still later, by the Christians in their neighbourhood."

The Lombard style of architecture was mixed, combining the Latin basilica, the Byzantine cupola, and the round and polygonal forms. Crypts were added to their churches. The Lombards derived their taste in building rather from Constantinople than Rome; and, indeed, it was natural that their artists should have felt the influence of the neighbouring monuments of Ravenna, when their princes had established their government in the country. The people called Lombards, a corrupt abbreviation of *Longobards*, so called from the length of their beards, dwelt between the Elbe

derius, the last of the Lombard princes, the kingdom surrendered to the victorious arms of Charlemagne, in the year 774.

The earliest buildings attributed to the Lombards in Italy are the Churches of San Frediano and San Michele, both at Lucca, and of San Michele and San Pietro Cielo d'Oro, both at Pavia, built in the seventh and eighth centuries. Many old edifices have been so modified in the course of time, the primitive portions removed and new portions substituted, that the original character of the architecture can only be detected in details. Thus, in the cathedral at Lucca, the lower arches of the nave are Lombard, the upper portions Gothic. San Michele was founded by Teutprandus and Gumpranda, his wife, in 1164, but the fine façade belongs to the date of 1168. San Frediano is more in the style of the old basilicas than in that of the Lombards. At Lucca, the Churches of San Salvatore, *Santa Maria Forisportam* (that is, Santa Maria beyond the gate), and San Pietro Somaldi, are Lombard; so also is San Cristoforo, but its façade shows the transition from the Lombard to the Italian-Gothic. The Cathedral of Pavia is built on a Lombard foundation; and the original structure of that at Turin was built by Agilolph, King of the Lombards, about the year 600—602.

Remains of this style, more or less mixed with the Byzantine, are scattered over a large portion of Italy; but limited space prevents our multiplication of examples.

"The new features," says Mr. Gally Knight, "by which what is called Lombard architecture is distinguished, are additional ornaments, both external and internal. This difference is seen externally in the slender compound piers or buttresses, which are carried up the front of churches, from the ground to the eaves; in the small arcades of the open galleries, which follow the shape of the gable, or crown the semicircular apse; in the multiplication of the sinkings and mouldings of the portals; and in the crowd of imagery with which these mouldings are enriched. Internally, the difference appears in the frequent substitution of compound piers for single pillars; in the dissimilarity of the capitals; and in the profusion of images, often grotesque, with which the capitals of pillars or piers were now for the first time adorned. Christian symbols had been admitted into churches at an earlier period, but till the seventh century they had been admitted with a sparing hand; and amongst the variety of figures which were now introduced, there are a few which appear to have emanated from the mythology of the north. It need hardly be added that, in the seventh century, the rules and proportions which had been so exactly observed in classical times were altogether neglected. The height of the piers no longer bore any reference to their bulk; the piers and pillars of Lombard buildings are short and stunted. Ancient rules were departed from in other respects. Pedestals and architraves were omitted; the pillar or pier rested on a simple base, and the arch sprang direct from the capital."

The imagery alluded to in this extract was fantastic, and apparently incongruous, but had a concealed symbolical meaning. There were mixed together the representations of men, beasts, birds, fishes, and fruits: as the four beasts of the Apocalypse; Daniel, David, and Goliath; Theseus and the minotaur; the peacock, the goat, the deer; the vine; dragons, serpents, eagles, and dogs.

In the year 800, Charlemagne, conqueror of the kingdom of Lombardy, was crowned Emperor of the West by Pope Leo III.; and in his buildings on the banks of the Rhine introduced the Lombard and Byzantine styles; while his Cathedral of Aix-la-Chapelle was modelled after the Church of San Vitale, at Ravenna, constructed by Constantinopolitan architects in the reign of Justinian. Aix-la-Chapelle subsequently furnished the model for the cathedral at Cologne, which was in turn imitated at Worms, Spire, and Mayence. At Augsburg, the cathedral is covered with rude bas-reliefs in the Byzantine style, in which sacred and heathen subjects are blended after the Lombard fashion. At St. Stephen's, at Vienna, in the more ancient portions of the fabric, the remains perhaps of the primitive church, the Byzantine character may be detected.

Lastly, in chronological order, come the Normans, who impressed on Lombard forms and Byzantine details, mingled with Saracenic features, an architectural character peculiar to themselves during their occupation of Sicily. The various fortunes of this heroic race present a lively picture of the chivalry of romance. Under Hasting and other chiefs they frequently devastated France, from the Loire up to Paris, till at length, under Rollo, they obtained from Charles the Simple possession of Neustria, the name of which they changed into Normandy. Other expeditions of piratical Normans were directed against the broken and exposed provinces of the Greeks, Lombards, and Saracens, and one division established themselves at Aversa, in Italy. Before this period the Arabs had conquered Sicily, wresting it from the empire of Constantinople, and the emperor was eager for its recovery. He made overtures to the Norman adventurers, who entered his service, and, chiefly by their valour, the followers of Mohammed were expelled. But the ungrateful emperor withheld the promised reward. William of Hauteville and his followers were indignant at this baseness; their countrymen established at Aversa shared their indignation: uniting their forces, they seized the province of Apulia, from which a vain attempt was made to expel them, for in a sanguinary battle they completely routed the Asiatics. This victory consolidated the Norman power in Italy, and fresh adventurers from their native country flocked to their camp, allured by the love of fame or the hope of plunder.

Tancred of Hauteville, in Lower Normandy, in the diocese of Coutances, was the father of twelve valiant sons, by two marriages. Ten of them, eager for glory and fortune, joined the Apulian

encampment. Robert, afterwards named *Guiscard*, on account of his political sagacity, the eldest of the seven sons born of the second marriage, after twenty years passed in the performance of heroic deeds, became Duke of Apulia, Calabria, and Sicily. His youngest brother, Roger, highly distinguished himself against the Moslems in Sicily, and ultimately became king of that fertile island. Bohemond, son of Guiscard, carried terror to the gates of Constantinople. The Greeks compared the father and son to the caterpillar and the locust—"the last of whom devours what has escaped the teeth of the former." The Norman occupation of Sicily, and of that portion of Italy which corresponds with the limits of the present kingdom of Naples, and the frequent intercourse, hostile or friendly, of the Norman chiefs with the Greek emperors, tended to impress on their architecture a mixture of Mohammedan and Byzantine style. In Sicily there may be observed in their buildings a style Saracenic in the arches, Roman in the pillars and capitals, Byzantine in the cupolas and mosaics, and Norman in the enrichment. According to Mr. Gally Knight, in the Norman-Sicilian style, the architects used their familiar billet moulding, dog-tooth moulding, and zigzag moulding, and introduced grotesque heads among the foliage of capitals, or under the eaves. It is presumed that Norman pietates, who went from Normandy to Sicily, supplied these ornaments. The Capella Palatina, at Palermo, was built by King Roger, in the year 1132, on which he employed Normans, Saracens, and Greeks, and it exhibits the three styles peculiar to those different people. The form is Latin, the cupola Byzantine, the roof Saracenic.

Some few remarks may here be offered on the Romanesque, or early Christian architecture, which originated at Rome in its declining days, and partook of the general debasement of the age. It spread to other portions of western Europe, and prevailed during eight or nine centuries. Its basis was that of the basilica, a building originally appropriated both to the administration of justice and the exchanges of merchants, but which, in the time of Constantine, was adapted to religious uses. This style of structure marks a transition period, vainly attempting to imitate the past, and wanting invention to create anything excellent of its own. It was modified by local circumstances, and received various names. In central Italy and Germany it was called Romanesque; in north Italy, Lombard; in the East, Byzantine; and in England, France, and adjacent countries, Saxon and Norman. A modern writer, Mr. Tarbock, describes it in the following terms:—"There is in it a general squareness and massiveness of effect; the arches are round, and of the horse-shoe form, usually springing directly from columns, with incongruous capitals and bases, often designed with a total disregard to proportion, and sometimes so far perverted from their true object as to be carried on brackets. They are round and polygonal on plan, and are applied in all situations—in the naves, and to doors and windows. Broad, flat, and pilaster-like buttresses are frequently used; and rude and primitive coarseness is generally characteristic of the sculptured decorations. The *coup d'œil* is altogether gloomy, heavy, and formal, with an almost total deficiency of elegance, grace, and lightness; although efforts would seem to have been made to counteract this result by means of frescoes and mosaics, stiff and hard in the extreme."

The Byzantine and Romanesque are links between the Classic and Gothic styles, and indeed in all varieties of architecture certain relations may be detected, one form sliding into another. "Thus," as Messrs. Wyatt and Waring well observe, "the most superficial examination cannot but reveal to the student how Roman architecture—itsself an offspring of Greece—was gradually transformed by successive changes into the Byzantine style, which in its turn varying with the course of ages, and undergoing modifications according to the means, the disposition, and necessities of the people who adopted it, resolved itself into two remarkable phases, in the Lombard and Norman styles; from which again sprung, as a necessary consequence, when we consider the climate, character, and creed of those artists who shaped its progress, and that which must be regarded as one of the most magnificent proofs of man's power over dull matter which time has bequeathed to us—the Pointed system of architecture. Thus then we perceive that in architecture, as in all other works of creation, there is no gap; and were our means of gaining a knowledge of all the architectural works ever produced but microscopic, we should doubtless be enabled to supply the series of links wanting to connect all styles; and hence the very apparent opposition existing between one ancient system—the Roman—and another—the Gothic—only renders more interesting

the Byzantine style, which, with its offshoots, served to connect the two. . . . In such associations of idea, the Romanesque monuments yield in interest to none. They are vestiges of an age singularly troubled and romantic, and are tinged, as it were, with the light of two suns—on one side by the setting sun of an old world, on the other by the earliest gleams of a new day dawning on a new people and a new life. Fiction itself could desire nothing more strange than the incidents which many of these monuments witnessed."

In the period under review, that is, from the decline of Art in Rome to the Renaissance, another modified style arose in the form of round churches, of which class seven existed in England; of these three have perished, viz., Temple-Bruer, and Aislaby, both in Lincolnshire, and the Old Temple, in Holborn. Those that survive are the Temple Church, London, on which the Benchers of the Inn have bestowed the liberal sum of £50,000 in restoration; St. Sepulchre's, at Northampton; the Church of Little Mapledsted, dedicated to St. John of Jerusalem; and the Church of the Holy Sepulchre at Cambridge, which the Cambridge Camden Society intended to re-construct, at least, so far as necessary repairs were needed, in all its pristine features. They expended upon it a considerable sum, but were not allowed to complete the work they had commenced, so as to preserve the antique style. Men smitten with the ambition of being improvers, and emulous of the fame of *touching up*, are too apt to fall into incongruities, substituting their own ideas for those of a remote generation. In this manner epochs are confounded, and the lessons of primitive architecture cease to be instructive. These round churches belong to the epoch of the Crusades, and the cost of their erection was chiefly paid by the piety of the Knights Templars and Hospitallers. They found the models at Jerusalem. Helena, mother of Constantine the Great, pulled down a Temple of Venus, erected over the site of the Holy Sepulchre, which paganism had erected to conceal the spot where stood the tomb of the Saviour, in the vain hope of obliterating the memory of that solemn event; but the Holy Sepulchre was found undestroyed, and over it Helena and her son erected the Church of the Resurrection, in the circular form. It was destroyed by fire when Chosroes the Second sacked Jerusalem. His grandfather, Nushirvan, had meditated the conquest of the Holy City; the Magi insisted on its destruction; and the furious bigotry of the Jews offered Chosroes an army of twenty-six thousand men. The capital of Judea was taken by assault, and committed to the devouring element. "The Sepulchre of Christ," says Gibbon, "and the stately churches of Helena and Constantine, were consumed, or at least damaged, by the flames; the devout offerings of three hundred years were rifled in one sacrilegious day; the patriarch Zachariah, and the true cross, were transported into Persia; and the massacre of ninety thousand Christians is imputed to the Jews and Arabs who swelled the disorder of the Persian march."

The Church of the Resurrection was rebuilt in the reign of Constantine Monomachus, and it is fair to presume that the original style was closely, if not exactly, imitated, being in the circular form, surrounding the Sepulchre. It was this style that the Christian pilgrims and Crusaders followed in the round churches of England. Their piety was sincere, of which the hardships they incurred furnish incontestable proof. The historian, David Hume, in speaking of the Crusades, describes them "as lasting monuments of human folly," but that profound philosopher appears to have overlooked their civilising results. All western Europe, at that period, was a prey to baronial brigandage; the castles of the nobles were fortresses from which they sallied forth to plunder the industrious cultivators of the soil; neither age nor sex escaped their brutalities, and even the sanctuaries of religion were frequently polluted by their rude and profane hands. It was, therefore, an act of deep policy on the part of the Church to find a new field on which these ruffians could indulge their warlike spirit, and with that view, as much as from devotional feelings, they poured Europe into Asia. During their absence the land was tilled, and the burghers of towns carried on their industry in peace. Then movable property began to accumulate, and with its growth a sense of personal independence manifested itself, which, in due season, extinguished serfdom. In this sense, the Crusades form an important epoch in the history of civilisation.

We have engraved the round church of the Holy Sepulchre, at Cambridge,* which, from a manuscript in the Bodleian Library,

appears to have been consecrated in the year 1101. As the order of the Knights Templars did not obtain landed possessions in England prior to 1134, it could not have been built by them; but there can be no doubt that it owed its construction to some person or persons connected with the Crusades. It is thus described, as recently restored, by an anonymous writer in a modern publication:—

"The ancient and round portion of this church consists of an outer circular wall, with a rich Norman door-way, opening into an aisle, which embraces a central round, resting on eight circular piers, and finished above with a clerestory, surrounded by an arcade, pierced with eight lights, and finished with a conical roof. The piers are low and massive, without bases, and with capitals of varied designs. The arches are all circular, and some of them adorned with the zigzag moulding, so characteristic of the Norman style. To this part of the church is added a chancel, and two aisles, of perpendicular character, with an octangular bell-turret at the north-west angle of the north aisle; and thus the present church consists of a circular nave and aisle, with the chancel and its north and south aisle, and bell-turret, extending eastward from the round. In the interior the effect is greatly heightened by the introduction of rich painted glass, and an appropriate style of furniture and decoration throughout. The round is, of course, the part of most interest, and here the windows bear, many of them, reference to the history of the Church. One represents the Resurrection, with an obvious allusion to the Church of the Resurrection, after which, as we have stated, this church is designed. Another is of the venerable Bede, the great historian of our early Church, who is said (but on the authority of a tradition which will not bear minute canvassing) to have resided for a time between the site of St. Sepulchre, and that of St. John's College; and who happens to be the only person who has handed down to these times a description of the round churches existing in his day. Another window represents St. Etheldrida, whose history is connected with Ely, in which diocese the church is situated. The east window of the chancel, which appears to great advantage on immediately entering the church, is of beautiful painted glass, representing the crucifixion, with the figures of the ever blessed Virgin, and the beloved Apostle, as they are associated with the cross of Christ in mediæval art, on the authority of the Holy Gospel."

Around the exterior of the Byzantine Court are several figures which are interesting as exhibiting specimens of the art of statuary and of military costume belonging to the thirteenth century. The armorial bearings of some indicate the persons represented. Among them are supposed to be two members of the ancient family of De Roos. The first figure, carved out of Roach Abbey stone, in Yorkshire, and clad in chain mail, belongs to that family. Next to it is an effigy of a knight crusader, in Purbeck marble, clad in ring mail. This is supposed to be Lord De Roos of Fursan, who died in 1227, but the identity is clouded by some doubts. Then follows William Mareschal, the elder, Earl of Pembroke, who died in 1219. His effigy is of Sussex marble. Next appears the reputed effigy of Geoffrey de Magnville, Earl of Essex, in Sussex marble. All these are on the left as the spectator faces the Court. The first on the right side is said to be the effigy of Gilbert Mareschal, Earl of Pembroke, who died in 1241. It is of Reigate stone. Next it, and of the same material, is that of his brother William, who died in 1231. The heraldic evidence of these figures, belonging to the Pembroke family, is the appearance of a lion rampant. Beyond them are the effigies of two knights, in Purbeck stone, whose names are unknown. Of these eight statues, six are cross-legged; whence it has been assumed that they represent crusaders; but this attitude is not decisive proof of the persons commemorated having fought in the Holy Land. All these figures have been cast from those now in the Temple Church, Strand. Some betray vestiges of colour, in others it is not discoverable.

The arcaded façade of the Byzantine Court is taken from the cloisters of an ancient church at Cologne, called St. Mary in Capito, founded by the wife of Pepin L'Heristal, though the cloisters were not built till the tenth century, by Archbishop Bruno. When Cologne was occupied by the Romans, they built there a capitol, and on its site the church was erected—hence its name. It combines the Roman basilica and the Byzantine temple, and its design has been generally imitated in the Rhenish provinces. Several portraits are ranged above the piers of this façade as illustrations of Byzantine art, among which are Charles the Bald, King of France, and his father Louis, called Le Debonnaire; Judith, sister of Charles the Bald, was mother of our Alfred the Great, having married Ethelwulf.

* See Engraving on the following page.

Justinian and his wife, the Empress Theodora, are here depicted, from the mosaics preserved at San Vitale, in Ravenna. Justinian ascended the throne of Constantinople about fifty years after the fall of the western empire, at which date the Goths and Vandals had respectively established their rule in Europe and Africa. Both those warlike nations he completely subdued through the skill and valour of his celebrated generals, Belisarius and Narses. We have fully described his magnificent structure of St. Sophia, and the historian Procopius may be referred to for ampler details of his other contributions to architecture. He multiplied the fortifications of Europe and Asia; and from Belgrade to the Euxine, from the conflux of the Saone to the mouth of the Danube, a chain of about fourscore fortified places was extended along the banks of the great river. A strong fortress defended Trajan's Bridge. He re-peopled the solitude of ancient cities; and though he suppressed the schools of Athens, and abolished the consulship at Rome, he knew how to

the streets to the palace, became the concubine, and afterwards the wife of Justinian. But this remarkable woman, steeped as she had been in vice, had a martial spirit and the soul of a hero. During a sedition, when the courage of the emperor deserted him, and he was preparing to flee from his capital, Theodora exclaimed in the midst of the timid and vacillating council, which even the great Belisarius attended, "If flight were the only means of safety, I should disdain to flee. Death is the condition of our birth; but they who have reigned should never survive the loss of dignity and dominion. I implore heaven that I may never be seen, not a day, without my diadem and purple; that I may no longer behold the light when I cease to be saluted with the name of queen. If you resolve, O Cæsar! to flee, you have treasures; behold the sea, you have ships: but tremble lest the desire of life should expose you to wretched exile and ignominious death. For my own part, I adhere to the maxim of antiquity, that the throne is a glorious sepulchre." By



ROUND CHURCH OF THE SEPULCHRE, CAMBRIDGE.

select and reward men of genius. He patronised the profound juriconsult Olympius, and the crude and discriminating Tribonian; the learned physicians, Dioscorus and Alexander; the grammarian Metrodorus; and Anthemius, the mathematician and architect. The name of this emperor will ever be associated with the Code, the Pandects, and the Institutes. It is true that he acted with base ingratitude to Belisarius, but it is not true that he deprived that general of his eyes, or compelled him to beg his bread. Gibbon has shown that "give a penny to Belisarius" is a fiction of modern times. Justinian died eight months after his famous and persecuted officer, having lived eighty-three years, and reigned thirty-eight.

The empress Theodora, and her two sisters Comito and Anastasia, all remarkable for their beauty, were public courtesans of the commonest class in early life, selling their venal charms to the promiscuous crowd of purchasers, and exhibiting their nude persons on the theatre of Constantinople. Theodora at length passed from

this spirited speech she inspired her husband with fortitude, and quelled the sedition.

The last figure on the right is that of Nicephorus Botoniatas, one of the generals of Michael Duca, Emperor of Constantinople, who, for a short period, usurped the empire. It has been selected as illustrating in a high degree the richness of Byzantine costume. Michael Duca was odious to his subjects; he received the surname of *Sarapinaees*, which, says Gibbon, "denotes the reproach which he shared with an avaricious minister, who enhanced the price and diminished the measure of wheat." Against him two of his generals revolted, Nicephorus Bryennius and Nicephorus Botoniatas. Bryennius led his troops against Constantinople, and allowed them to burn and pillage one of the suburbs. This lax discipline caused his ruin; for "the people who would have hailed the rebel, rejected and repulsed the incendiary of their country." Botoniatas, more prudent, pursued a protective and wiser policy, and by the united

voice of the patriarch, the synod, and the senate, he was raised to the imperial dignity—Michael Ducas, tamely surrendering the insignia of royalty, and receiving in return the monastic habit and the title of Archbishop of Ephesus. The reign of Botoniates was short. He had been faithfully served by Alexius Comnenus, although a relative of the line of Ducas, but he felt that his dethronement was just. Alexius, by valour and conduct, suppressed three rebellions, and his warlike career gained for him the esteem and confidence of the troops; but he refused to march against a fourth rebel, who had married his sister. His former services were now forgotten, and fearing to forfeit his liberty or his life, he raised the standard of revolt, and proved successful. Alexius ascended the throne, and Botoniates was immured in a monastery.

On the return side of the Byzantine Court is an allegorical figure of Night, a Virgin and Child, and a figure of Day, none of which are very remarkable for artistic conception or execution.

The visitor will now enter the cloisters, where he will behold specimens of ornamental sculpture peculiar to Constantinople and Venice, but chiefly taken from the Cathedral of St. Mark's, in the latter city. Among these are the statue of St. George slaying the Dragon, and of St. Theodore, who was the patron saint of Venice till he was superseded by St. Mark. To the honour of St. Theodore, known on earth by the name of Tyro, a young Syrian soldier who suffered martyrdom during the reign of Maximin, A.D. 235, Narses, the famous general of Justinian, the rival in military fame of Belisarius, and conqueror of the Vandalic kingdom in Africa, erected a chapel in Venice. Here are German Romanesque columns, and an effigy of Richard Cœur-de-lion, from Rouen, discovered in 1838, in the cathedral of the capital of Normandy; but as it greatly varies from the recumbent figure of this monarch at Fontevault, it is not considered to bear a faithful resemblance to the original. Beneath his effigy is an altar frontal, having in the centre the figure of Jesus, and in the spandrels symbols of the four evangelists. Such symbols were common in the Romanesque period, and the practice may be traced among the heathens to a very remote antiquity. It is dominant in the Egyptian system, and wherever Sabeism or astrotheology prevailed; so that in early Christian churches the usage was undoubtedly copied from pagan precedents. In the representation before us the eagle is attributed to St. John, the angel to St. Matthew, the lion to St. Mark, and the ox to St. Luke.

On entering the interior of the Byzantine Court, the first door on the left, as the visitor advances from the cloister arcade, is taken from the Church of Kilpeck, in Herefordshire, built in 1134. This church is remarkable for its symbolism. In fact, when the art of printing was unknown, and few even among the highest, except the clergy, could write or read, sculptured or carved appeals to the eye were the best means of awakening piety and impressing historical facts. Of the emblematical character of the Church of Kilpeck, Mr. Lewis has given some ingenious illustrations and solutions which are too interesting to be here omitted; moreover, in a most forcible manner they express the spirit of the age, and therefore are eminently instructive; and, as has been frequently remarked in the course of this work, the Sydenham Palace has higher objects to promote than mere fugitive amusement. "The beautiful and highly intelligent design of the *Door and the Way* contains the leading features of the Old and New Testaments most skilfully arranged. The open part, or entrance, is the long upright beam or body. The open space above, which contains the tree, is the short beam or head; and the two horizontal portions, one on each side, and which are filled with crosses, are the arms. Viewing these parts when taken together, we have the cross. On further contemplation of this religious work, we find that the Alpha and Omega are contained therein, and that the trees of life and knowledge, of good and evil, are there designed most appropriately. The tree of life is placed in the head of the cross, over the entrance, and the tree of knowledge on the columns on each side of the piers. The tree of life is divided into three principal parts, symbolical of the Trinity, the centre or head, and two arms, preserving the cross form in the design. The head is divided in the same manner into three parts, a head and two branches; the branches are represented as the fruit arising out of the head, producing again the cross form. The two branches of the first division are divided into eight parts, seven of which represent foliage, in allusion to the beginning (Gen. chap. i.) of the number seven, and the one fruit. In this arrangement of the tree of life, the designer makes it to contain in the head the Trinity, and in the two

branches the natural and spiritual world, the Alpha and Omega. The stem of the tree is made to proceed from a foundation of light, which the angular forms at the base of the tree are designed to convey." This beautiful and ingenious description shows that taste and invention flourished, however exceptionally, in what have been too indiscriminately termed the dark ages. The designer of Kilpeck had in him the poetic element, a rich fancy, and a fine judgment. Mediævalism has indeed been ridiculously praised, and most absurdly undervalued. Illustrations such as those referred to, teach us to avoid both extremes, and enable us to arrive at a rational criticism.

The next illustrations are from Romsey Abbey, being specimens of grotesque sculpture, frequently mixed up with religious subjects during the Romanesque period. These are followed by early sculpture from Chichester Cathedral, representing the raising of Lazarus. In the figure of the Saviour "the eyes appear to have been drilled to receive jewels or enamel, a very usual custom in the Byzantine school." The large doorway which follows is copied from the Cathedral of Mayence, on the Rhine, while the bronze doors which it encloses are from the Cathedral of Augsburg. In the course of this work we have had to describe on more than one occasion the theological subjects represented on the panelling of doors, particularly the truly magnificent work of Ghiberti, which alone well repays an excursion to the Sydenham Palace; therefore, we need here only indicate the carvings taken from Augsburg, as the repetition of the same theme becomes tedious. These depict the creation of Adam and Eve, Samson slaying the Philistines and the lion, the rod of Moses turned into a serpent, that of Aaron which brought forth buds, and the miracle of his rod swallowing up the other rods, Joshua commanding the sun and moon to stand still, and Elijah fed by ravens. Such at least are the probable interpretations of the panels, though some are so obscure as to baffle any attempt at solution.

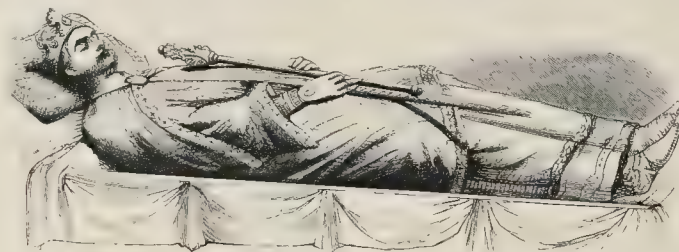
The central arcade of the Court is taken from the cloisters of St. John Lateran, at Rome, one of the earliest of the basilicas converted to Christian uses. It is remarkable for its mosaics. On the right are the bronze doors from Hildersheim Cathedral, in northern Germany, which, though executed before those of Augsburg, are considered superior in finish; but the subjects in the panels are of the same theological character, and with this difference, that the Augsburg doors only illustrate passages from the Old Testament, while those of Hildersheim include both the Old and the New. There are sixteen panels. The subjects of the first eight are—the creation of Adam, the presentation of Eve to Adam, the guilty pair eating the forbidden fruit, the consciousness of their guilt and the covering of their nakedness, their expulsion from Paradise, Adam tilling the ground, and Eve nursing a new-born baby, the offering of Cain and Abel, and the death of Abel. In the second row of panels is the Annunciation, the birth of Christ, the offerings of the Three Kings, the presentation of Christ at the Temple, Christ brought to the judgment by Roman soldiers, Christ nailed to the cross, the visit of the Marys to the tomb of the Saviour, Christ Triumphant, holding in one hand the Cross of Victory, with the other pointing to Sin prostrated. This Cross of Victory is known as the consecrated banner, or *Labarum* of Constantine—"an obscure though celebrated name," says Gibbon, "which has been vainly derived from almost all the languages of the world." He describes it as a long pike intersected by a transversal beam. The silken veil which hung down from the beam was curiously enwrought with the images of the reigning monarch and his children. The summit of the pike supported a crown of gold, which inclosed the mysterious monogram, at once expressive of the figure of the Cross and the initial letters of the name of Christ. There is still extant a medal of the Emperor Constantius where the standard of the *Labarum* is accompanied by the memorable words, "By this sign thou shalt conquer."

Gelnhausen, in southern Germany, furnishes the arcade above the cloister of St. John Lateran, executed in the Lombard style, marked by grotesque figures, wild animals, and abundant foliage. The pelican is here conspicuous. It symbolised the sacrifice of Christ for the salvation of the world, as this bird, according to old tradition, fed her young from the blood of her own breast. The lion seizing the limb of a man is the lion seeking whom he may devour. The doorway of Shobden Church, in Herefordshire, now pulled down, is next represented as restored. It is decorated in the allegorical fashion already described, as at Kilpeck. Before this door-

way is the monumental effigy of Roger, Bishop of Salisbury, from the Cathedral; and then follows the prior's entrance to Ely Cathedral, supposed to belong the latter half of the twelfth century. Here, again, the figures of animals are introduced, and, what is more remarkable, that of a mermaid. On some of the details, as in the leaves cut in low relief, the Byzantine character is strongly impressed. Symbolism, the characteristic of the age, predominates. In the absence of theatres and newspapers, which among the moderns reflect the spirit of passing times and events, it was natural that the minds of the mediæval artists should take that direction, and hence the admixture of the sacred and profane in

sustained a sceptre, as indicated by marks on the breast. The mantle was fastened by a *fibula*, or brooch, on the right shoulder, its original colour having been a deep reddish chocolate. The *dalmatica*, or long tunic, was crimson, starred with gold. The boots green, with gold spurs, were fastened by red leather straps. The gloves had jewels on the centre of the back of the hand, a mark of royal or ecclesiastical dignity. The crown, which Matthew Paris describes as of gold or gilt, was broken off; but the drawing of it, taken by Montfaucon previously to the Revolution, shows that it had leaves like those on the crown of Richard I.

The Fontevault effigies include—Henry II.; Richard I.; Queen



TOMB OF RICHARD CŒUR-DE-LION, AT FONTEVULT.

their illustrations. The mediæval calendars of husbandry exhibit the same feelings; and in the borders of the great painted window, at Notre Dame de Paris, may be seen an allegory of the months—as February warming his feet by the fire, June mowing grass, and October brewing his beer. After the Ely doors follow specimens of Venetian sculpture—one representing the baptism of Christ by St. John. As a mark of the simplicity of the age, the Virgin mother is here depicted after plain household life, with a spindle in her hand. Peacocks are introduced, their ample tails bound in a circle, to symbolise infinity and eternity, the circle neither having a beginning nor an end. The next illustrations are from the Abbey of Moissac, in Languedoc; while the fountain in the centre of the

Berengaria, from the Cathedral of Mans; King John, from the Cathedral of Worcester; Eleanor of Guienne; and Isabella of Angoulême. In mediæval times, the practice of burial was different from the present, the body, heart, and viscera being frequently deposited in different localities; hence different monumental statues were raised over the dead.

The visitor now passes to the gallery of the Byzantine Court, the entrance to which is formed by the chancel arch of the Tuam Cathedral, county of Galway. This church appears to have been built between 1120 and 1150. The piers inside the gallery are from the Church of Rathain, near Tullamore, in the King's County. The rise and progress of building in Ireland may be traced back to a



PLANTAGENET PRINCES, AT FONTEVULT.

court is from the Abbey of Heisterbee, near the "castled crag of Drachenfels," which "frowns o'er the broad and winding Rhine."

We then come to the Fontevault effigies, the abbey of which name, purchased by Henry II. of that name, and King of England, became the royal burial-place of many of the princes of the Plantagenet line. The recumbent statue of Richard I., Cœur-de-lion, has the most historic interest, on account of his warlike deeds and chivalrous character as a crusader; but the particulars of his life are too well known to require any narration. The statue of his father, King Henry II., was discovered by Mr. Stothard, and his description of it cannot fail to be acceptable to the reader. The right hand, on which was the great ring, was broken, but originally

remote date; but to what race the primitive inhabitants belonged is a vexed question among antiquarians. It may be presumed that the Phœnicians were acquainted with Ireland; and it is said they gave it the name of *Ierne*, changed into Erin. Then Spaniards settled there, who derived their knowledge of the country from Phœnician navigators. The Irish annalists assert that they were led by a chief named Milesius, and his followers called the island *Iibernia*, resembling Iberia, the ancient name of Spain. Then succeeded some Belgic races, whom the Irish have named *Gaels* and *Firbolgs*. Christianity, in a pure apostolic form, existed there in the sixth century; and its self-governed Church was independent of Rome. At that epoch it was more learned and civilised than any

other country in Europe. The architectural antiquities of the country of the oldest class consist of *cairns*, or tombs, *cromlechs*, or altars, and *raths*, called moats or military fortresses. The cairns were heaped piles of small stones, pyramidal in form, marking the graves of the dead, in the rudest style. The cromlechs are supposed to have been ancient altars. They were composed of large stones. The dimensions of one stone in a cromlech, found in a field between Waterford and Tramore, as given in the Rev. Mr. Ryland's *History of Waterford*, are twenty-one feet long, eighteen broad, and from one foot to three feet thick. Some etymologists derive the word from *Crom*, God, and *leac*, a flat stone. Many of these cromlechs, like our Christian churches, lie directly east and west.

The *tumulus*, called a rath or moat, is common in Ireland. Some of these had caverns hollowed underneath, and vaulted with stone. In Dr. Ledwich's *Antiquities* will be found the following interesting description of one of these raths:—"About the year 1699, a Mr. Campbell, who resided in the village of New Grange, observing stones under the green sod, carried much of them away to repair a road; and proceeding in this work, he at length arrived at a broad flat stone, that covered the mouth of the gallery. At the entrance, this gallery is three feet wide, and two feet high; at twelve feet from the entrance it is but two feet two inches wide. The length of the gallery from its mouth to the beginning of the dome is sixty-two feet; from thence to the upper part of the dome eleven feet six inches; the whole length seventy-three feet six inches. The dome or cave within the long gallery gives the exact figure of a cross; length between the arms of the cross twenty feet. The dome forms an octagon twenty feet high, with an area of about seventeen feet. It is composed of long flat stones, the upper projecting a little below the lower, and closed in and capped with a flat flag. There are two oval rock basins in the cave, one in each arm of the cross. On first entering the dome, not far from the centre, a pillar was found, and two skeletons on each side, not far from the pillar. In the recesses were three hollow stone basins, two and three feet in diameter."

Specimens of the military rath, or fortress, still remain—one the Staig Fort, in Kerry, the other on the summit of a mountain on the eastern shore of Lough Swilly. The date of these caverned and military raths are not known, but may fairly be referred to a high antiquity. Church building belongs to a more recent period. Bede mentions a church, built by Finianus, an Irishman, for the episcopal see on Lindisfarne, of spliced oak, thatched with reeds. About the eighth century stone was used. Cormac's Chapel, now in ruins, on the rock of Cashel—the remains of Glendalough, in the county of Wicklow—the Abbey of Knockmoy, in the county of Galway—and the old Church of Ardmore, in the county of Waterford, are fine examples of what were the excellences of Irish ecclesiastical architecture. It is certain that, at least, prior to the year 1170, the Irish clergy understood and practised sculpture, painting, carving in wood and metals, and used them for the embellishment of their churches. Ireland was also celebrated at an early period for its skill in illuminated missals and psalters, music, and even for its schools. It sent out many eminent missionaries to foreign countries.

In the gallery may be seen specimens of Irish crosses, and crosses from the Isle of Man, the latter ranging in date from the tenth to the latter part of the thirteenth century, when the island was possessed by the Danes and Norwegians.

We have now completed a survey of all the Fine Arts' Courts, giving to each such an amount of pictorial illustration as denotes their distinctive characteristics. This survey ranges over rather more than three thousand years, and embraces a great variety of nationalities. The space to which it is confined precluded all aim at completeness, and an attempt has only been made to sketch an outline—to indicate a subject in general terms, and not to exhaust the details. A cursory visit to the Sydenham Palace excites wonder, and the mind is overwhelmed by the magnitude of the objects exhibited within its crystal walls. To form a just appreciation of its real merits, every one feels that he ought to prepare himself by a course of historical and antiquarian study. He stands in the presence of a vast panorama of extinct life, of vanished institutions, of habits and usages long since passed away, of decayed forms of polytheism, and of superseded arts. It is from the reproduced memorials of the past that he desires to penetrate into the inner life of those by whom those monuments were constructed, to institute comparison,

to pry into hidden secrets, and recall into existence the buried generations of distant centuries. In this busy age few have sufficient command of leisure to prosecute such varied and difficult researches—and to supply, in however humble a degree, a guide to the student formed the design of this publication.

In an early page of this work, we recommended, if not a separate Indian Court, at least some collection of Indian antiquities, and such an addition has since been made, and it would be desirable if those of China were included; indeed, the Sydenham Palace should be made an emporium of all that is curious and interesting, derived from all countries, ancient and modern, and thus its attractiveness and usefulness would annually increase. Among the Indians, the imaginative faculty was most active, and hence the mysticism which prevailed. In gigantic works of architecture they have never been excelled; and in the delicate art of weaving they have surpassed all nations. In temples, hewn out of solid rocks, their ingenuity and perseverance are most remarkable, as in the monumental edifices at Ellora, and in the islands of Salsette and Elephanta. Their philosophy was profound, though rashly speculative in many particulars; their poems, rich in fancy and beautiful in language; and though their chronology was fabulous, they made great progress in astronomy; their mythic, traditional, and metaphysical writings have engaged the criticism of the most learned of European scholars.

The Egyptian Court in the Crystal Palace is magnificently illustrated. From Egypt ample streams of knowledge flowed into Greece, and Moses himself "was versed in all the science of the Egyptians," but he derived intellectual and moral treasures from a higher source. "All that appeared to Moses," observes Schlegel, "truly sound and excellent in Egyptian customs and science, or serviceable to his purpose, he adopted and used with choice and circumspection; but all that was incompatible with his designs, and which he knew to be corrupt, he strenuously rejected, or he gave to it a totally different application, and established a higher principle in its room." But the great German philosopher adds, "Many of the Mosaic precepts, indeed, especially such as have a reference to external life, to subsistence, diet, and health, and which are in part, at least, founded on reasons of climate, are entirely conformable to Egyptian usages, and are found to have been practised among that people; for these ancient lawgivers and founders of Asiatic codes did not scruple to give even medical precepts in their codes of moral legislation, that embraced the minutest circumstances of life."

The light of Egypt shone on the darkness of early Greece. The intellectual character of Egypt was profoundly scientific. In the natural sciences, in mathematics, in medicine, the priests of Osiris and Isis were pre-eminent. Their religion was astro-theological, and their architecture was made to speak the language of astronomy in symbolising the attributes of the gods. The Isiac mysteries preceded those of Eleusis. Here was the birth-place of hieroglyphics. Egyptian sages were the teachers of Pythagoras and Plato, and from them Herodotus stored his mind with the fabulous, the traditional, and the true. Byron, addressing the stars, calls them "the poetry of heaven," but in Egypt each particular star, and each configuration or congeries of stars, became the basis of a stellar poem. From these the Greeks largely borrowed, and the ingenious Dupuis has shown that the twelve labours of Hercules form an Egyptian solar fable, descriptive of the passage of the sun through the twelve signs of the zodiac.

Greece, in the early periods of its history, comprehended Peloponnesus, Greece Proper, Epirus, Thessalia, and Macedonia; but, when subjected to the rule of the Romans, it was divided into two provinces, Achaia and Macedonia—the former containing the first and second of the ancient divisions, and the latter the other three. The Greeks were of various extractions, many tribes having emigrated from their native homes. The Pelasgi were the aborigines, and the presumed builders of those gigantic walls and constructions known as Cyclopean. At a later date, Greece excelled in architecture, sculpture, and painting; and, in despair of eclipsing its fame, modern Europe has been its imitator. In all varieties of poetry and prose, and in a searching philosophy, though speculative, and frequently unsound, Greece has been the teacher of posterity. In valour, in fortitude, in patriotism, her sons have never been excelled; and none can estimate all the results to civilisation which flowed from the Macedonian march through Persia to the Indus.

Greece fell by the Roman sword, but by her arts she conquered the conqueror:—

"Græcia capta ferum victorem cepit et artes
Intulit agresti Latio."

The Etruscans first taught the Romans the arts of construction; in which, indeed, they never made any great progress by native talent—for Rome was essentially a school of war, and ever prone to foreign conquest and territorial extension. They plundered Greece of its most beautiful statues, the masterpieces of an earlier age, and transported from Egypt its magnificent obelisks. By them the Temple of Jerusalem was despoiled of its treasures. In this manner Rome was embellished, and by the works of Greek artists, who sought and found remunerative occupation in the mighty capital. The Romans could appreciate foreign genius, and their poets took the Greeks for their models, and profoundly studied their philosophy as recommended by Horace:—

—"Vos exemplaria Græcæ
Nocturnâ versate manu, versate diurnâ."

But if the Romans were not eminent in the arts, they were unsurpassed in jurisprudence, and their maxims are still quoted in our courts. Their civil law pervaded all the relations of private life; but it was strict to severity—for their jurists insisted that justice should be done, though chaos came again. However, with respect to the arts, Rome still remains the city of the world, both on account of its antique treasures, which have escaped the ravages of time, and the beautiful works erected at and after the period of the Renaissance.

As Rome declined, the world declined; when it fell, civilisation fell, and barbarism prevailed. But between the decline and fall was a long and interesting interval. Constantine founded a new empire in the East, and there the arts found a new home, and architecture displayed a new style, from which sprang numerous branches and varieties. We have referred at length to the great architectural triumph of Justinian in the building of St. Sophia, and shown that this Byzantine model was imitated at Ravenna and Venice, and that its spirit modified the constructions over a large part of Italy. We have traced its influence among Mohammedan conquerors, who introduced many of its fundamental features into Spain, as at the mosque of Cordova and at the Alhambra, while the Normans planted that Eastern style in Sicily. It spread to Asia Minor, Armenia, and the Caucasian provinces, and still dominates at Moscow. The Slavonic, Arab, and Greek races felt the influence of Constantinople, not only commercially, but artistically; and it has been observed of the triumphs of the Byzantine masters, that none who have contemplated them can "have failed to be overcome by deep emotion at their majesty and richness, the largeness of their well-arranged masses, the depth of their mysterious shadows, and the brilliant effects of their burnished lights. There is a religious solemnity about them, which produces a consonant effect upon the spirit—and by no works of man's hands are the chords of his heart tuned to sentiments of devotion at once more profound and more exalted."

Returning to Rome, we have seen the debased condition to which art was reduced in that capital at the era of Constantine. Taste and genius had departed from the imperial city. None could build a triumphal arch; and to celebrate his own triumph, Constantine had to plunder or adapt one of the arches constructed by Trajan. The sculptures executed in his reign were beneath mediocrity.

Subterranean chapels, or crypts, in which the bones of martyrs reposed, were then regarded with reverence, and over them Christian temples were raised. Church architecture adopted the basilica. Then followed the diversified style, known as the Romanesque, of which the Lombard is regarded as the earliest development, which penetrated far and wide, leaving its monuments in Italy, France, and Germany. In those constructions, strength was more attended to than beauty. Many buildings took a round or octagonal form. Arcaded galleries were introduced, and in the German Romanesque, the interiors were marked by plain massive piers, instead of columns. In England the Romanesque was heavy, and in it may be noticed, as a remarkable feature, the absence of vaulting in the nave, in the place of which a wooden roof was substituted.

We have passed through the epoch of mediæval art, rich in its cathedrals, in the beautiful pointed arch, and in the magnificent rose windows. Of this so-called Gothic style there are two species: the one plain and robust, resembling the simplicity of the Tuscan; the other light, airy, and ornamental, approaching the decorated manner of the Corinthian or Composite. The former exclusively aimed at solidity and durability—its short, round, and massive column being fashioned after the trunk of the sturdy oak; its arch was semi-circular, round, or in the shape of a horse-shoe, while its plain thick walls were without buttresses. This style belongs to the Saxon era. It was improved upon after the Norman conquest, when science and the arts began to revive. Then was introduced the thin or slender column, and clusters of such columns resembling trunks of trees united or tied together, decorated with a pointed arch, a profusion of ornaments, buttresses, and pinnacles. There have been critics, bestowing their exclusive admiration on Greek architecture, who denounce the Gothic structures as destitute of taste, order, or uniformity; but they are in a small and unenvied minority. There is a solemnity and grandeur about our cathedrals which impress the mind with awe, and act most powerfully on the religious sentiment.

It may be noticed that the Gothic architects introduced the spire on churches as typical of the immortality of the soul. The Egyptians always built pyramids over their cemeteries, and it is from the pyramid that the spire is copied. In the ground-plan the figure of the cross was observed to denote a Christian temple, and the spire, mounting upwards as flame does, denoted that the soul of the true believer, after separation from the body, ascended to heaven.

The Renaissance succeeded to the Mediæval style, when the artistic antiquities of Greece and Rome became the subjects of ardent study. Renaissance, or Revival, is a compendious term, including the progress of painting, sculpture, and architecture, in the thirteenth, fourteenth, fifteenth, and sixteenth centuries. The first is the preparatory, the second the advancing, the third the perfected epoch. Cimabue is the pioneer of this age of restoration. He imitated nature, and abandoned the formalism of the Greek teachers of the day. His example was followed by his contemporaries; the next generation improved on their models, and Massacio was the chief of the second period. In the last, the celebrated triumvirate, Leonardo da Vinci, Raffaello d'Urbino, and Michael Angelo Buonarrotti, ruled supreme, and have never been excelled. From their epoch art declined, and new schools were started which abandoned the pure and severe style observed by their predecessors.



THE INDUSTRIAL COURTS.

USEFUL ARTS, MANUFACTURES, AND MACHINERY.

INTRODUCTION.

IN a recent visit to the Crystal Palace our attention was attracted by a collection of minerals, and one of the first specimens which we took up was a piece of a hard granular stone called *corundum*. This rough-looking pebble awakened a world of associations:—of men widely separated by space, yet mutually dependent on each other for subsistence; of men who are probably ignorant of each other's existence; of different climes, races, religions, complexion, language. The Greek of Naxos, or the Turk of Gumnuchdagh, finds the parent rock of this refractory stone projecting from the earth, or situated a little below its surface; he raises it by a rude species of mining—separates it by the hammer, often assisted previously by heat, into smaller masses—transports it on the backs of horses or camels to the seaport, whence it is brought to England—and then, after undergoing a laborious process of stamping and

more impressive. A collection such as may be expected in a Trade Museum or a Crystal Palace, of raw materials, manufactures, tools, and machinery, if properly arranged and described, must necessarily form an instructive exponent of the wealth of the country to which it belongs—its internal and external resources, its points of strength as well as of weakness; it must furnish instruction to all—to the artist and the artisan, to the manufacturer and the consumer, to the producer and to him who loves to contemplate production. It must teach us, if viewed aright, that progress and prosperity depend as much on commerce as on internal riches, and that all the members of the great human family may promote each other's happiness and their Maker's glory, by spreading the blessings of civilisation, by exchanging the natural or manufactured products of their respective countries, and, when they come to know each other better, by exchanging their thoughts, their aspirations, their books—the less-



Fig. 1.—WROUGHT-IRON BALCONY.

crushing, it is separated into powders of varying degrees of fineness by sifting; and some of these, by being suspended in water for varying lengths of time, are reduced to still greater tenuity—the powder that remains the longest suspended being the finest. These powders are used for various processes in which abrasion, smoothing, and polishing, are required, especially in the manufacture of plate-glass, for which there is so large a demand from so many quarters. And this beautiful material, the product of such apparently worthless articles as sea-sand, and an alkali obtained from common salt, or sea-weed, employs thousands upon thousands of individuals in its direct manufacture, to say nothing of the subsidiary trades—the merchants, the clerks, the ships, the sailors, the capital, the enterprise set in motion by this industry.

Let us take another specimen: here is a lump of antimony: it was probably brought into its present state by a native of Hindostan: it is a somewhat rare metal, scarcely ever talked of in common life, as iron, or brass, or gold is;—and yet were it not for this obscure metal the progress of knowledge would long ago have been arrested, since the multiplication of printers' type by the comparatively cheap and simple process of casting would have been impossible; for it is the rare property of antimony to expand in cooling, and thus, by filling up the mould, to give sharp impressions, such as could only be otherwise obtained by the costly process of chasing or carving each letter separately by hand.

Thus, if we view them rightly, all the productions of nature are full of interest and instruction: the productions of art may be even

informed submitting to be taught, the wise and the good desiring to teach, and to carry out the divine mission of the Gospel, "Peace on earth, goodwill towards men." If the rulers of the earth would allow their subjects to hold free intercourse with each other, civilisation and its accompanying blessings would move more quickly, war and discord more slowly.

We are called upon to speak of the industrial features of the Crystal Palace. We should have been better pleased had they been more prominent; but, such as they are, they will enable us to write a few chapters suggestive, we hope, of profitable reflections to the thoughtful reader. The Useful Arts ought to occupy a lofty position in a country which gave birth to a Smeaton and a Brindley, an Arkwright, a Telford, and a Watt; and the literature of the Useful Arts ought to be a worthy record of the wealth, the glory, and the intellect of such a country: we fear, however, that, as a people, we do not estimate very highly such things as Trade Museums and technological treatises: they do not thrive in our land. The reason probably is, that a free people, accustomed to do everything for themselves, are engaged in earnest working efforts each for his own peculiar good, and succeeding in that, the result is an aggregate of prosperity, of national wealth, of public good, the result of private interest. The people have no time for what they call theory; they cannot see how a Trade Museum will enable Manchester to produce more cotton, or how a technological treatise will cause South Wales to smelt more copper or iron. In Paris, the *Conservatoire des Arts et Métiers* excites admiration by its extent, completeness, and logical

arrangements; while its extensive library contains thousands of memoirs and hundreds of volumes on the Useful Arts, which are perfect models of research and style. Such results can be produced in France, where the government centralises everything, and thinks it necessary to look after and manage everything for the manufacturer—to instruct him in his trade, and to provide first-rate teaching for his people in much that they are concerned to know. And yet, in spite of all these advantages, France is not more prosperous, more intelligent, more happy, wise, or prudent than England. Why is this? The answer is manifold; but we will, at least, attempt to give it.

The visitor to the Great Exhibition of 1851 could not have failed to be struck with the vast amount of raw material displayed by Great Britain (alas! that those specimens once collected should ever again have been dispersed!), greatly exceeding in variety and abundance the collection of any other country—with a plentiful supply of the ores of iron, copper, tin, lead, stone for erecting furnaces, and coal for feeding them; thus showing that we have within our grasp the materials for machinery, the means of constructing it and working it, superior to any other nation in the world. The steam-engine performs the work set for it with untiring zeal—and thus the various branches of manufacture which are in any way dependent on each other, no longer wandering far and wide in search of waterfalls to turn their machinery, can collect together in a single town, and like the various members of a body corporate, carry out each its appointed functions, independently of the other members, and yet contribute something to the welfare of the whole. If we had to send to distant parts of the world for our coal, our iron, our building-stone, and such like bulky necessities, it would have been impossible for us to have multiplied steam-engines and machines for producing machinery, which contribute so much to our national wealth.

There is, however, another cause which has contributed powerfully to our prosperity, and that is our insular position. Surrounded on all sides by the sea, we are enabled to communicate with all the nations of the earth in the readiest and cheapest manner. Commerce thus becomes natural and easy to us; we can visit and be visited by all nations, and not be necessarily affected by their quarrels and dissensions; and if we quarrel among ourselves, it is a blessed thing that a stranger, an armed peacemaker, has not the power to cross our frontier, and settle our disputes. We have had internal quarrels enough:—First, the ruled contended with the rulers for liberty of speech and action, and they shed their hearts' blood in securing to themselves and to us, their children, the right to worship God according to the dictates of conscience; and with this precious privilege came another almost as precious—liberty of discussion—liberty of the press—blessings which we have so long enjoyed, and know how to use on the whole with moderation. Secondly, our forefathers contended against that abominable system of monopolies, which placed in the hands of a privileged few the sole right of selling and disposing of certain articles of use or necessity. Ever since the year 1624 industry has, with few and trifling exceptions, been left quite free—every man has been allowed to choose his own occupation, and to carry his wares or his talents to the market of his own choosing. Thirdly, the struggle has been going on, and is even now continued, between the manufacturer and the excise officer, of late years with great success: some of our most important articles of manufacture have been freed from duty, and from incessant visits of inspection, more oppressive even than monies paid for duty. In fact, progress has been made in free trade; protection and prohibition are becoming obsolete terms; other nations are beginning to see the absurdity of interference between men who would freely exchange their respective commodities. If an Englishman, with a piece of cloth in his possession, meets a foreigner who has a sack of corn for sale, why should they not be allowed to exchange their respective commodities if they are so disposed? The fact is, that when nations, from whatever cause—from the encroachments or ambition of a single ruler, from conflicting interests or disputed possession—become jealous of each other, they try to do without each other, and thus erect rival manufactures, for which the soil, climate, or capabilities of the people may be ill-fitted; and when failure comes as the natural consequence, they attempt to bolster up the sickly thing by laws and prohibitions, and duties and custom-house officers. They search every man's box, and every woman's basket, to see whether the offending thing—the little bit of soap, the paper of tea, or the roll of tobacco—dares to intrude itself on the soil which did not produce or manufacture it. And this state of things going on for hundreds of years, men come

to think that such institutions are just and reasonable, because they are very old: if you talk of abolishing them, they regard you as a person dangerous to the state—they look upon you with horror, and groan over the degeneracy of the times.

The causes of our success, then, as a nation, are to be found in the abundance of raw materials for machinery and manufactures which we possess—in our insular position, our free institutions, the honesty of purpose, industry, enterprise, and resolute will of our countrymen in general. There are other causes which, under the Divine sanction and blessing, have contributed to the greatness of this country, which will readily suggest themselves to the reader.

We were speaking of the scant success of Exhibitions of Useful Arts, and of treatises thereon. Doubtless the people who are actively engaged in doing their work effectually and well, and prospering therein, care but little to employ their leisure in reading about it, or hearing lectures about it. Men enjoy their newspaper or their novel, the social meeting or the concert. When the day's work is over they do not much care to be instructed. Hence mechanics' institutions fail; or if they succeed, it is often on account of the amusing lecture or the amusing library. We fear that it is too late to begin to teach the working man—his child is a more promising subject; and, knowing this, we shall be judged harshly or kindly by the next generation for our efforts in this.

But if our technological teaching is not very successful, our scientific teaching promises to be more so. The Useful Arts have no other basis than science. A man may be skilful in business, in accounts, in the organisation of a factory—but he cannot succeed unless he is willing to allow science to watch his proceedings, and to correct and amend them from time to time. This truth is now being well understood even among our agriculturists, who from their isolation do not experience that intellectual friction to which manufacturers, crowding together and competing together in a town, are exposed. They now admit that a process, even though transmitted to them by their forefathers, is not necessarily the best; they admit the value of the steam-engine, of improved machinery, and of chemical analysis; and it is now refreshing to hear a small farmer in a remote rural district talk learnedly of superphosphate of lime.

All the processes of the Useful Arts rest upon mechanical or chemical principles. It is not meant by this that the Useful Arts are the result of the profound appreciation of scientific principles; on the contrary, technology existed long before science was known. Man was acquainted in the earliest times with the potency of fire, and employed it to smelt metallic ores, to prepare his food, and for innumerable other purposes. He could raise stone from the quarry without any very exact appreciation of the properties of the lever: in short, by repeated trials and repeated failures, he succeeded in inventing those sets of processes which belong to trades, or arts and *mysteries*, as they were called. As the art of tanning leather was not of much interest to the brewer of beer, since the tanner and the brewer lived by an interchange of commodities, each artisan in process of time appropriated to himself the peculiar processes of his own trade, and taught them only to his apprentices, so that, being unknown to the community at large, they constituted his art and mystery. Thus these processes continued to be practised for thousands of years, forming as they did a series of facts for a later science to generalise—just as the collection of animals, plants, and minerals, formed the facts for those systems of zoology, botany, and mineralogy, &c., which have proved such powerful aids to the respective branches of knowledge to which they belong. It was necessary to ascertain the facts and verify them before they could be reduced to principles; but when, by a careful study of the properties of matter, and the various conditions under which it exists, principles were once discovered, new facts could be found, old processes varied and improved, and time, labour, and material be economised. As mechanical science, from the simpler conditions on which it rests, arrived much earlier at perfection—that is, the arrangement of facts known as their induction or generalisation was more easily made in the case of the mechanical than the chemical sciences—so mechanical arts were in a high state of development, while the chemical, if existing at all, had not been brought under the domain of science. It was, however, a grand step towards improvement when it was generally admitted that air and water, heat and light, act according to the same laws in all the arts; that an art or mystery had no independent existence, but that the mystery, when held as such, was generally some principle of nature badly understood, and that tech-

nology could only move securely when under the guidance of science. When science was once allowed to shed light upon art it was found that, with a knowledge of principles, a man does not work blindly or rashly; that he is not exposed to costly and ridiculous failures; that he can often predict what will happen under certain given conditions, or he can perform an experiment on the small scale which will inform him as to the nature of the results to be expected on the large. In fact, whenever induction is complete for any large sets of phenomena, the science or subdivision of human knowledge so called, proceeds deductively—foretells what will happen when the conditions are known: this is the peculiar province of science—a high intellectual faculty to which the Useful Arts can lay no claim. The most exact description of an art or trade is like a chart in the hands of a navigator who has no compass by which to steer. Let Science shed intelligence on the chart, and the sailor not only obtains his compass to guide him through known regions, but high above him a bright Pharos, illuminating the known, and piercing even into the distant regions of the unknown.

It is evident, therefore, that the arrangements of a technological museum must be guided by a profound knowledge of applied science; and that a technological treatise, to be of any value, must be based on scientific principles. In the few chapters which we propose to devote to the Industrial Courts of the Crystal Palace, an attempt will be made to bring out the chief facts or principles on which each division or subdivision of industry rests, leaving the intelligent reader either to work up to the subject or to pursue it further. At the present day, when scientific books of greater or less value are in the hands of every one, it is not to be supposed that a

few short chapters on applied science can be unintelligible to the general reader.

In the original design of the Crystal Palace there was an earnest intention to give to the Useful Arts a prominent place worthy of themselves, and of their position in the Great Exhibition of 1851. With this view a number of courts were laid out for the exhibition of certain goods, or the productions of certain industrial localities. These Industrial Courts have been constructed from the designs of eminent architects and artists, and they consist of—1. The Court for Musical Instruments, designed by Mr. John Thomas. 2. The Court for Printed Fabrics, designed by Sir Charles Barry. 3. The Court for Woollen and Mixed Fabrics, designed by Professor Semper. 4. The Stationery Court, from the designs of Mr. Crace. 5. The Birmingham Court, designed by Mr. Tite. 6. The Sheffield Court, by Mr. Stokes. In the vicinity of these courts, in the south nave, there are also displays of furniture, carpets, and hardware, pottery, porcelain, and glass, soap and candles; while in the south-west gallery perfumery, chemicals, leather, and india-rubber, invite attention. There are philosophical instruments in the west gallery; china and glass in the north gallery, together with displays of electro-plated and other glittering goods; and not far from them are the good things with which Mr. Gunter delights the palates of his customers; while other ministers to appetite display their varied goods under the head of Substances used as Food. Clothing being as necessary as food, an important display thereof is made in the south gallery; while on the basement floor our mechanical engineers make a gaudy display of machinery in motion.

THE RAW PRODUCE COLLECTION.

In the above remarks we have attributed no small share of the success of Great Britain and Ireland as a great commercial nation to their vast natural stores of raw materials. No institution which professes to illustrate the Useful Arts of this country can be complete without an abundant display of such natural resources. It is, therefore, with great satisfaction that we find that in the north wing of the palace a collection is being made, under the competent superintendence of Professor Wilson, bearing the generic name of RAW PRODUCE; the object being to show what are the natural resources of the British Islands, of her colonies, and other countries—to illustrate the natural history of various useful products, and the means by which they are converted to the use of man. The object of the collection is stated to be twofold—first, to display raw produce from the animal, vegetable, and mineral kingdoms of nature; and, secondly, to trace such produce, by means of specimens, through the various processes by which a crude material becomes converted into a finished article of manufacture.

And here we must take leave to make an exception to the term "raw produce" as applied to this collection. If finished products are to be exhibited, deeply interesting and impressive as they are, by the side of the raw material, the collection ceases to be one of raw produce, but really becomes one of manufactures. The lump of auriferous quartz contained in one of the cases is a raw product; but the leaf of gold, 250,000th of an inch in thickness, the last member of a long series of very instructive specimens contained in the same case, is a highly artistic, finished product. Again, the collection of tortoise-shells, horns, &c., used in the manufacture of ladies' combs, admirably illustrates the raw produce of this branch of industry; but when in juxtaposition therewith we find a variety of specimens showing the mutations to which that useful article tortoise-shell is subjected, before it is fit to support woman's beautiful tresses, the collection becomes eminently illustrative of manufactures. The same remark may apply to the collection of cork barks used by the corkmaker, and to the varieties of finished corks which accompany it, and so on of many others. The collection, however, in its present imperfect state, is valuable, and promises to supply at, we hope, no very distant period, such a trade museum as might have been formed on the breaking up of the Great Exhibition of 1851.

It is intended to group the contents of this collection under three principal divisions—viz., I. The Soil. II. The Produce of the Soil. III. The Economic and Technical Uses to which such Produce is applicable. Under the first head will be included various agricultural soils, and the manures best adapted to their cultivation: here, also, we find squared specimens of building-stones, slabs of slate,

the various clays used in brickmaking, the sand used in glass, a case of specimens from Cheshire, illustrating the manufacture of common salt; while on one side of the entrance to the gallery is a noble specimen of rock-salt, in the form of a polygonal column, from Northwich. The Patent Alkali Works have a collection of illustrative specimens: we have mica in the rock, and as prepared for use (a curious and valuable substance, showing nature's skill in glass-making); then there are hydraulic cements, a progressive series of specimens from the porcelain works of Staffordshire, encaustic tiles, which add so much to the beauty of our new churches, and remind one pleasantly of the skill, enterprise, and munificence of their chief manufacturer, Mr. Minton. Specimens of coal, the *pabulum vite* of our manufactures, are numerous—accompanied by some of those marvellous stereotypes of ferns, gigantic canes, and tropical plants, which bewilder the geologist in his attempt to account for their production in our cold northern regions. Next we find an interesting sulphur group, showing the various states in which that invaluable element occurs in the market or in the laboratory; then we pass from bright yellow to brilliant white—to an instructive series which illustrates the manufacture of white-lead by the Dutch method. The connoisseur in smoking may fondly gaze on a choice collection of meerschaum bowls, and examine at leisure the crude specimens of these curious silicates of magnesia, and form his own theory as to the origin of the term meerschaum, *écume de mer*, or sea-foam, given to these solid-looking masses. The artist may study at leisure various collections of colours; and the economic mineralogist may find employment in examining the various ores and specimens of the useful metals. The first thing that arrests the eye on entering the gallery is an unusually fine specimen of red hematite from Ulverston, only equalled by a glorious specimen of black hematite, in another part of the gallery, from the Cleator Mines, near Whitehaven, in Cumberland. Next to this is a column of the recently discovered carboniferous ore from the neighbourhood of Middlebro', which two or three years ago lighted up numerous blast-furnaces with unexampled rapidity; and the specimen before us justifies the enthusiasm, for it is a column from the upper lias formation, eight feet in height; and this is said to be only half the thickness of the deposit: the ore is said to contain about 30 per cent. of metal. Next we come to specimens of the celebrated black-band ironstone, so valuable for containing bitumen sufficient to roast the ore when it has once been lighted, and thus save the fuel formerly expended on that necessary operation. While among the iron ores, we looked about half hoping to meet with Mr. Blackwell's magnificent collection, the pride of the raw produce department of the Great Exhibition of

1851. With the abundant space at command, and the known liberality of mine-owners, we see no reason why collections should not be made on a scale equally vast and comprehensive. This is what a Trade Museum ought to be: it should resemble a perfect book of reference, never disappointing the referee, but telling him the very thing he wants to know exactly at the time he requires to know it. Such a collection, it is true, belongs rather to the Government than to a Company, and the want of such an institution, which is now being keenly felt, will, we trust, hasten on the steps which are already being made for its accomplishment. The Burra-Burra mine has its magnificent specimens of copper malachite, rivalling that of Russia; and the American Mining Company has contributed some good specimens of copper ores: the ores of lead are well illustrated; chrome and its magnificent salts, tin, mercury and gold, zinc, and the method of rolling it. Such are some of the specimens in the first grand division: and in the second division the specimens illustrative of the produce of the soil consist of vegetable substances, or direct produce and animal substances, or secondary produce; and these again are subdivided into substances used as food, whether of vegetable or animal origin, and substances used in the arts, whether of vegetable or animal origin; and these again are classed

dant illustration of hemp and flax—the finest linen and the coarsest rope, showing the two extremes of the manufacture; nor is the cotton-tree forgotten, a moderately large collection of specimens, showing how various is the colour, texture, and staple of this much-sought-for product, varying as it does in commercial value between five-pence and upwards of fifteen-pence per pound; and again we have an instructive collection of woods, showing by various sections, modes of working and polishing, the properties of various kinds of timber, many of which were unknown even by name when first introduced to Hyde Park in 1851: then again we have a variety of dye-woods and plants, madder, fustic, and indigo, and fabrics dyed therewith in various stages; gums, perfumes, and artificial essences—that curious discovery in modern chemistry by which a fetid oil, obtained during the rectification of brandy and whiskey, yields—by distillation with that powerful mineral acid, the sulphuric, in company with a salt, the acetate of potash—that delicate essence which so closely resembles the taste of the jargonol pear; so successfully too are the greengage, the apricot, the black-currant, the mulberry and pineapple imitated, that one manufacturer speaks with a sort of contempt of pineries and orchards, fruits, gardens, and the richly-laden dessert table. A collection of the roots used in medicine may



Fig. 2.—RAW PRODUCE COURT.

as home and foreign products. The third grand division is also subdivided into articles used as food and those used in the arts—the home and the foreign produce being distinguished, and a separation being made as far as possible between the chemical and the mechanical manufactures.

In our rapid *coup d'œil* we may notice a fine collection of wools, in some cases with the wool worked and partly manufactured; alpaca tops, combed, hair and bristles; a collection of commercial feathers, including the skin of the emu, with its curious feathers, like a mass of delicate sea-weed. The marvels of the silkworm are strikingly displayed in one case, while close by is the tiny cochineal, showing how important small things become when it is to the interest of man to foster and multiply them. The coral, the ivory, the mother-of-pearl, and the tortoise-shell, find their exponents here; the tanning of leather, and the astringents used in the process, serve to connect the animal and the vegetable kingdoms—and the latter kingdom pours out for our instruction much of its marvellous riches. Here we have a noble collection of wheat, there an abun-

dant collection of quinine at hand to allay it. Calcutta sends a collection of rattans and other canes; various kinds of straw-plait exhibit the dexterity of nimble fingers, while the wheat straws, best adapted to the purpose, are also exhibited. Tobacco is shown in various forms—the leaf, the manufactured article, and the cigar; and one manufacturer has perpetrated the ingenious fancy of converting one large leaf of tobacco into nineteen cigars, nine on each side and one in the middle, leaving them attached to the fibres, and reminding one of the schoolboy's puzzle of writing your name without leaving off. The acids produced by the destructive distillation of wood, and their application to the manufacture of sugar-of-lead, is the last group that we propose to notice in this somewhat desultory ramble through a department of the Crystal Palace to which we wish good speed and success. In the course of the few chapters which we are about to devote to the Useful Arts, we shall have to return to the Raw Produce Department as the starting-point for the finished manufactures which occupy other parts of the building.

THE SHEFFIELD COURT.

THE SHEFFIELD COURT is from the design of Mr. G. H. Stokes, the effect of which, from the admixture of styles, is striking without being inharmonious. The materials used in the construction are iron and plate-glass; the panels on the outer walls are of the latter substance within gilt mouldings, and the pilasters and the frieze over the large panels are of the same brilliant material. An arcade of iron columns above is elaborately ornamental. On entering the Court from the nave, the interior decorations resemble the exterior, except that the large lower panels are filled with red cloth, which serves to make more conspicuous the articles exhibited: the frieze or space above the columns is to be appropriately occupied with paintings illustrative of the Sheffield manufactures.

Commencing our rapid glance with the case which bears the name of Rodgers, so well known throughout the world for excellent cutlery, our first glance transports us in imagination to the woods and wilds of an infant country, where man depends on himself, and not on a community—makes his own law, and enforces it by his own

tortoise-shell, and various metals, common and noble. The next case, the exponent of J. Noel and Sons, contains knives and cases of the same, arranged in the neatest fashion for very particular people. There are also razors in pairs, and in sets of seven—one for every day in the week, with the day neatly etched on the back of each blade, a contrivance which we should think as fidgetty as it is undesirable, especially to persons with strong beards; for when once a razor is in good order, it should be used from day to day, until it requires setting, a second razor should then be used in a similar manner. Here gentlemen may indulge in every variety of dandyism in the form of dressing-cases, ladies may puzzle themselves in choosing from the immense variety in the patterns of scissors; and both ladies and gentlemen, mindful of future picnics, may provide themselves with neat leathern cases, containing knife, fork, spoon, &c. The next case, that of Stephen Martin, is rather unfavourable to the theory of wearing one's own beard, for here is a formidable display of razors, dressing-cases, and strops dressed by the cele-



Fig. 3.—INTERIOR OF THE SHEFFIELD COURT.

resolute will. Here we see the formidable bowie-knife, and the Californian knife, a knife-pistol called a self-protector, where, in the absence of powder and shot, a sharp blade may be projected forward by a spring; here we see also the more peaceful contrivances, such as a knife, fork, spoon, and corkscrew, all folding up into the moderate compass of a common rough two-bladed knife; then again we have a single handle supplied with a variety of movable blades, a saw, a hook, and things indispensable to a man who is required to be jack-of-all-trades; then again we have a tin case which serves as a drinking cup, and also as a cover to another case, containing knife and fork, spoon, and things wanted at dinner-time. In addition to these useful contrivances, there are various choice specimens of cutlery and steel blades, decorated with gold, etched, and otherwise adorned. The next case, belonging to John Walters and Co., is great in table-knives and forks, dessert-knives in gold and silver, or what appear to be such, carving-knives, bread-knives, and knives distinguished by their variety of handles, such as ivory and bone, agate and mother-of-pearl, carved wood, horn,

brated "emerald powder." Respecting the "magic" of strops, however, we are a little sceptical, and even incline to the notion that anything more than an exceedingly moderate amount of stropping is injurious to a fine edge. The strop should be hard, and moderately dressed, or the edge of the razor is liable to turn round. Almost any very fine powder will do for the dressing, such as fine emery, crocus, specular iron ore, black lead, or the charcoal of wheat straw. A razor should be stropped immediately after use, while it is warm, and yields more readily to those minute molecular changes on which its keen edge depends. The next case illustrates a curious and important branch of trade, namely, that of music-smith, or the man who forges the iron and steel parts of musical instruments. Mr. Greaves exhibits tuning-forks, keys, &c., and also what he calls Æolian mutes for violins—these are little clasps of metal which grasp the bridge of a violin, and prevent it from transmitting freely the vibrations of the strings to the resonant mass of air within the instrument, giving it a dull, muffled sound, so greatly to be preferred when the instrument is in the hands of a learner instead of a master. Messrs. Moss

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and Gamble exhibit a great variety of files, and some beautiful specimens of that admirable material, cast-steel, in the form of bars; also what is called extra cast-steel, for piston rods and stone-hammers; the same, "mild-centred," for taps and calico-rollers. Messrs. Cutts, Chesterman and Company, exhibit surveyors' chains, hand-drills, braces, graduated scales, vices, a roasting-jack, and a "cattle gauge," for ascertaining by measure, according to directions, the weight of any member of the bovine family. Mr. Turton occupies all one side of the Court with a goodly display of cast-steel in ingots, and manufactured into many useful articles, such as springs, axe-heads, plane-irons, chisels, gouges, awls, and punches; large spiral springs, and a large flat spring plate, beautifully etched with the maker's name and qualifications; files and rasps, one of the latter containing nine thousand teeth on one side; also fleshing-knives and curriers' knives, the latter, called the beam-knife, having its fine edge turned over by means of a steel tool, and preserved as a wire edge by means of a steel wire frequently drawn along it, by which contrivance the currier is enabled to take off the finest shavings from the skins. Mr. Jowett's case exhibits rasps, files, and steel bars; Butterly, Hobson and Co., by their scythes and sickles, remind us of hay-time and harvest; Mr. Cocker has a goodly display of needles, with the beautiful wire prepared for their manufacture, also a variety of gills and heckles for dividing flax; Marsden Brothers are great authorities on the subject of shears, awls, and drills, they have also chisels and axes, a goodly display of skates, with improved methods of attaching them to the feet, doubtless very pleasant substitutes for the old constricting straps—but why a gentleman's toes should be adorned with a couple of bright, silver-looking swans is not for us to determine. The idea appears to have been derived from the skate in the Exhibition of 1851, by Mr. Loy of London (Fig. 4). Cocker and Brothers exhibit various tools, circular saws, needles, gills, and other useful contrivances, together with wire-drawing plates and wordles. Thomas Wilkinson and Sons exhibit a variety of shears, dressing-cases, strops, razors, scissors with elaborate handles—one of which is in the form of a long-billed bird, its blades being formed by the bill; here we have also the Victoria scissors, in which the royal arms are introduced into the handle,



Fig. 5.—CAVENDISH SCISSORS.

reminding us of the Cavendish scissors, shown in Fig. 5, in which the arms, supporters, crest, and motto, are made to do duty. Mr. Wilkinson has also scissors with the Crystal Palace etched on the blades. Parkin and Marshall exhibit table cutlery and sharpeners, nut-crackers, edge-tools, saws, &c. Parker and Thompson exhibit joiners' tools and circular saws. Johnson and Co. have files, among which is a silversmith's rubber, the broadest ever cut with a continuous tooth. We pass on next to the cases which stand out in the room; and we are glad to find by the flourishing cases of Dixon and Son that the ingenious art of manufacturing goods in Britannia metal has not been annihilated by electro-metallurgy. Mr. Onions of Birmingham exhibits those useful articles, bellows, in great variety—from the huge bellows of the smith's forge to the

tiny drawing-room or library bellows. These useful articles are doubtless as efficient in action as they are ugly in form, and, like many other useful articles, should be kept out of sight as much as possible; but when we see an attempt made in what are called *fancy bellows*, to raise ugliness into competition with beauty, we must protest, not only against groups of flowers, Windsor Castle, Abbotsford, Stoke, Stratford-on-Avon, &c., occupying such positions, but in such an impracticable material as mother-of-pearl. The side of an old tower, however illuminated, never produces iridescence; the moon, the sky, the smooth-flowing river, do not display these flaring, lustrous, inharmonious tints; why should we, then, attempt to be more beautiful than nature, more gaudy, more impossible? and all this labour and ingenuity bestowed on the adornment of a pair of bellows! The last case that we have to notice in the Sheffield Court is Mr.

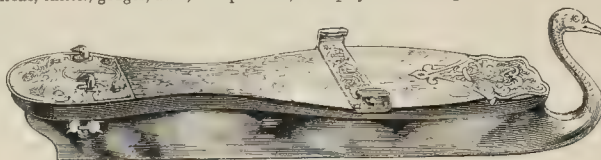


Fig. 4.—SKATE.

Horsefall's, in which music-wire, wire springs, centre punches, &c., are exhibited.

MANUFACTURE OF IRON AND STEEL.

In order to account satisfactorily for the production of the various useful articles contained in the Sheffield Court, we must return to the collection of Raw Materials, and just glance at the iron ores. There are probably few of our readers who do not remember Mr. Blackwell's splendid collection of iron ores in the Hyde Park building, consisting of nearly 500 specimens, all of which were the produce of the United Kingdom, thus placing in a most striking light the iron-making resources of this country. Now the mode of smelting or working these ores, the kind of fuel employed, and the subsequent treatment, furnish iron in one of the three states in which it is used in the arts—viz., *crude*, or *cast-iron*, *steel*, and *wrought-iron*. In order to produce steel, foreign iron is in request; and to produce different qualities of iron a mixture of different ores is required. The chief ores of iron are the magnetic, so called from its action on the magnetic needle: it is a very pure ore, furnishing most of the Swedish iron: it contains in 100 parts 71.78 of iron, and 28.22 of oxygen; and being smelted with wood charcoal, furnishes a pure iron, free from the sulphur and other impurities which lessen the value of iron smelted with common coal. Red iron ore, called *hæmatite*, from the Greek, in allusion to its blood-red colour, of which there are several varieties, occurs in Cornwall, at Ulverston, in Lancashire, and other places, in reniform, i.e. kidney-shaped masses, Fig. 6. This ore, smelted with charcoal, yields a very pure iron. Iron pyrites, or sulphuret of iron, contains 45.74 per cent. of iron, and 56.26 of sulphur: it is called *pyrites* from a Greek word for *fire*, from the circumstance of its striking fire with steel. It occurs in small cubical crystals, Fig. 7, in veins, in slate rocks and coal-fields, and in globular concretions in indurated chalk and clay; it also accompanies the ores of the other metals: it is used rather as a source of sulphur than of iron, as in the manufacture of alum and sulphuric acid. The ore from which the great bulk of the iron manufacture in this country is produced is the carbonate, which consists, when pure, of 61.37 per cent. of protoxide of iron, and 38.63 of carbonic acid: there are many varieties of this ore, one of which, sparry iron, is represented in Fig. 8. In England vast deposits of carbonate of iron occur in the coal formation, generally imbedded in schistuous clay, whence the ore obtains its most common name of *clay ironstone*. It occurs in regularly connected

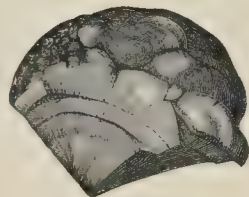


Fig. 6.—HÆMATITE.

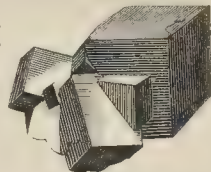


Fig. 7.—IRON PYRITES.

strata or bands, and in strata of detached stone, from the size of a small bullet to lumps of several hundred pounds weight. The black-band, or carbonaceous ironstone, contains a quantity of carbonaceous

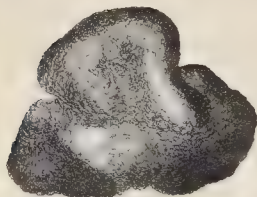


Fig. 8.—SPARREY IRON ORE.

matter, which greatly assists in the reduction of the ore. The most important iron-making district in Great Britain, and, indeed, in the world, is South Wales: its coal-field extends over an area of upwards of 800 miles, and it is remarkable for the varied character of its numerous beds of coal, and its measures of ironstone and black-band. Shropshire contains a highly important iron-

making district. The Dudley division of the South Staffordshire and Worcester coal-field is celebrated for its ten-yard, or thick coal: it also contains some valuable ironstones, and ranks as the second iron-making district in the kingdom as to the quantity of iron produced, while its manufacture of wrought-iron raises it above Scotland or Wales. Vast quantities of ironstone are raised in North Staffordshire, and sent to South Staffordshire and North Wales, where the coal is more abundant. The north and south districts of Yorkshire also produce good iron. In Derbyshire the beds of ironstone are often so thick as to be workable by open-work or bell-pits. The iron works of Northumberland, Cumberland, and Durham, are increasing in importance. In Lancashire and West Cumberland not much iron is produced; but the superior ore of the Ulverstone and Furness districts, containing from 60 to 65 per cent. of iron, is extensively raised for shipment to other districts. The iron produced in small quantity in the Ulverstone districts is smelted with charcoal, and is of very superior quality. The Forest of Dean is rich in ores, which are to a great extent raised for shipment, and furnish the iron used in the manufacture of tin plates. Other parts of the United Kingdom are opening up large masses of iron ores, in consequence of the facilities of transport afforded by our railroads; while old iron districts, such as the green sand of Sussex, which, in consequence of the exhaustion of our forests, have long ceased to furnish iron ores, may again be called upon to yield supplies.

The first operation in the smelting of iron is a preparatory one—namely, *roasting*, for the purpose of expelling water and carbonic acid, and producing a porous condition favourable to smelting. The coal is usually roasted in wedge-shaped heaps, formed by alternate layers of coal and ironstone, covered with small coal. The heap is lighted at the windward end, and the fire creeps slowly along, gra-

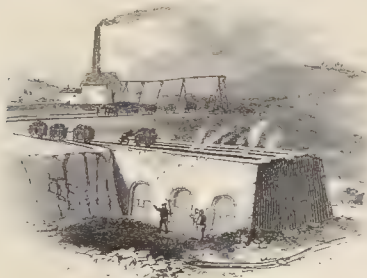


Fig. 9.—ROASTING IRON ORE IN KILN

dually igniting the whole. In the course of a month the coals are all burnt out, and the pile is sufficiently cool for removal. The ore is also roasted in kilns, as shown in Fig. 9. The black-band ironstone contains bitumen, which, when once ignited, serves for the roasting of the ore, and constitutes one of its valuable properties.

Much of the coal used in reducing the ore is previously coked in large heaps, as shown in Fig. 10, built so as to leave sufficient draught for the combustion, the flue-holes at the bottom of each heap terminating in vertical shafts in the centre. When the volatile matter of the coal is burnt off, the heaps are covered up with

the dust and ashes of former burnings, and the whole is left to cool. In Staffordshire every ton of cast-iron requires, including the roasting, from 3½ to 4 tons of coal. In Wales, where the coal produces a larger per centage of coke, the cost of fuel is about 3 tons of coal to 1 ton of iron.

Supposing the roasted ore to consist only of oxide of iron, it would be sufficient to reduce it to the metallic state to raise it to a red heat, and pass over it a stream of hydrogen gas. The hydrogen would



Fig. 10.—COKE HEAPS.

unite with the oxygen of the oxide, and pass off in the draught in the form of vapour of water, leaving pure metallic iron behind. A stream of carbonic oxide would answer the same purpose, the flame of which would deprive the iron of its oxygen, and become converted into the unflammable carbonic acid. It happens, however, that the ore is so intimately mixed with stony matters, such as clay or quartz, and other impurities, that when the iron is fused, its particles cannot combine or weld together, but remain entangled with the clay or quartz, which are infusible at the ordinary heat of a blast-furnace. In order to separate the iron from these substances, they must be made fusible. If the ore be very rich, it may be heated in contact with charcoal or carbon, when one portion of the oxide of iron, combining with the silica and the clay, forms a double silicate of alumina and protoxide of iron, which is very fusible, while another portion of the iron is reduced, the whole forming a spongy mass, which, being taken out of the furnace, and submitted to the blows of a heavy hammer, the slag is expelled, and the particles of metallic iron weld together. This method is adopted in the Pyrenees, in Corsica, and some parts of Spain, where wood for making charcoal is tolerably abundant; but it is a wasteful and expensive method, although the quality of iron yielded is excellent. If the ores are of poor quality, the silicate of alumina must be made fusible by a cheaper base than the oxide of iron, for which purpose lime is employed; but as the double silicate of alumina and lime is much less fusible than the double silicate of alumina and iron, as obtained in the former process, a very high temperature—such as is afforded by the blast-furnace—must be employed, in which case the iron combines with carbon, and forms crude, or cast-iron, which is found in a state of fusion below the fused silicate or slag. Such is the English method by which nearly all the iron at present manufactured is produced.

The blast-furnace consists of two truncated cones *AB* (Fig. 11), united at their bases. The upper part, called the cone or body, is formed by an interior lining or shirt of fire-bricks *ii*; *ll* is another lining of fire-bricks, with an intervening space, filled up with broken *scoria* or sand. The outer wall is of masonry or brick, bound by stout iron bands, connected by long vertical bars, furnished also with small channels to allow the escape of moisture. At the top of the furnace is the *throat* or *tunnel-hole* *a*; and above this the chimney *F*, through openings in which the charge of fuel, roasted ore, and limestone flux, is poured. The lower cone *B*, called the *boshes*, terminating in the hearth *E*, which is nearly quadrangular in form. The bottom of the furnace is formed of fire-stone, supported by masonry, in which are various channels *H*, for the escape of moisture: the foundations are traversed by two vaults *VV*, which intersect each other just below the vertical axis of the furnace. Three of the sides of the hearth *E*, are continued down to the bottom of the furnace; the fourth side *D*, is carried down to a

certain distance, where it is supported by cast-iron bearers let into the masonry of the walls, which also support a heavy block of sandstone, called the *tymp*. Below this, at a distance of five or six inches, and a little in advance of it, is the *dam-stone*, prismatic in

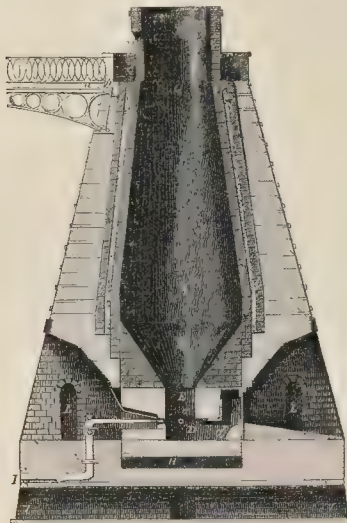


Fig. 11.—SECTION OF BLAST-FURNACE.

form, secured on its outer side by a piece of cast-iron, called the *dam-plate*. The part of the furnace below the tymp is called the crucible; and in it is collected the fused metal, reduced by the operation of the furnace. The three continuous faces of the hearth

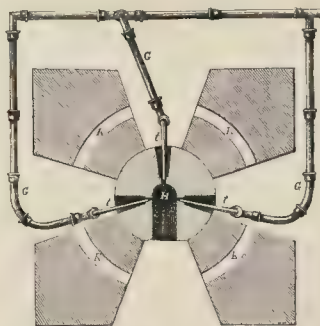


Fig. 12.—PLAN OF BLAST-FURNACE.

are perforated a little above the level of the tymp with holes *oo*, for receiving the nozzles of the tuyeres which convey the blast from the blowing-machine to the furnace. The vaulted galleries *LL*, in Fig. 11, corresponding to *KK* in Fig. 12, allow the men to pass from one tuyere to the other without loss of time. Fig. 12 is a horizontal



Fig. 13.—TUYERE.

section of the furnace at the height of the tuyeres *t*, showing their arrangement, and that of the pipes *G*, which connect them with the blowing-machine. The tuyeres are conical tubes of cast iron, kept cool by a current of cold water, which circulates over them by the arrangement shown in Fig. 13, in which the upper pipe conveys a supply of cold water into the hollow space around the tuyere, where, after circulating in the direction of the arrows, it is heated and discharged by the lower

pipe. Within these tuyeres are placed the nozzles of the blast-pipes. The blowing-machine (Fig. 14) consists of a large cylinder of cast-iron, in which a piston *P*, is worked up and down by means of the rod *B*, attached to the oscillating beam of a steam-engine. The cylinder communicates with the outer air by means of the openings *v v'*, and with the side-chamber *B*, by two other openings *v'' v'''*. The descent of the piston condenses the air below it, and this forces open the valve *v'*, and escapes into the chamber *B*. In this action the valve *v''*, becomes the more tightly closed, since it is hung so as only to open from without inwards. During this action an empty space is left above the piston, and the valve *v*, yielding to the atmospheric pressure, opens, and admits air above the piston; the valve *v'* now cannot open, since it is hung so as to open only into the vessel *A*. When the piston, having arrived at the bottom of the cylinder, begins to ascend again, the air above it becomes condensed, and passes through *v'''* into *B*, while *v'* becomes closed; at the same time fresh air rushes in below the piston, *v''* opening while *v* remains closed. The air in *B* is impelled through *o* to the pipes *G G*, Fig. 12, for supplying the tuyeres. The quantity of air impelled into a blast-furnace by one of these blowing-machines is something enormous. Some of the large Welsh furnaces consume on an average 3600 cubic feet of air per minute, or about nine tons weight of air per hour. These large blowing-engines are now being replaced by small high-pressure engines, moving with considerable velocity, and doing as much work as their gigantic rivals.

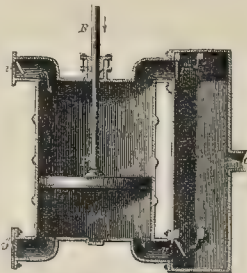


Fig. 14.—BLOWING APPARATUS.

The vast quantities of cold air injected into the furnace lead to a more than usually wasteful expenditure of fuel, since the air itself requires to be raised to a high temperature in order to be useful in maintaining combustion. Now it has been found that if, before injecting the air into the furnace, it be raised to a temperature of 600°, a much greater heat can be obtained in the furnace with the same charge of fuel, or the same temperature may be maintained with a diminished charge of fuel. By thus raising the heat of the furnace, certain substances, infusible in the cold blast-furnace, become fusible in the hot, uncooled coal can be used, either alone or mixed with coke, less limestone flux is required, and ores formerly unfitted for the manufacture of foundry iron can be smelted.

The dimensions of the blast-furnace vary with the kind of ore to be smelted from 30 ft. to 60 ft. In a large furnace the crucible is about 63 ft. high, and 21 ft. square at the top; the boshes 8 ft. high, and 12 ft. in diameter at the top. Some of the largest furnaces in South Wales have a diameter at the boshes, or widest part, of from 15 to 18 ft., and contain at least 150 tons of ignited materials constantly burning day and night—Sundays and week-days, summer and winter—lighting up the atmosphere for miles around with a lurid glare, depriving day of its beauty, and night of its repose, covering the face of the earth with coke heaps and roasting heaps or kilns, with waste products, or with the rubbish of the mine. The blast-furnace is, indeed, the central object to which everything ministers; and there is a certain grandeur about it, in spite of its inherent ugliness, arising from its vastness and its enormous powers of digestion. It is fed hour after hour, or oftener, with ton after ton of its appointed food; and twice, if not thrice, in the twenty-four hours it belches forth ton after ton of molten iron, which comes rolling on like a river in its strength, lighting up the gloomy shed with innumerable colours, and radiating an insupportable heat. Nor is the discharge of the slag the least impressive of the periodical displays made by this fiery monster. Referring to Fig. 11, it will be seen that from the dam-stone and dam-plate *d*, an inclined plane of brickwork proceeds, down which the slag flows, and congeals in fantastic shapes and beautiful crystalline forms. The hourly meal for a furnace of average size is 400 lbs. of coke, 336 lbs. of clay ironstone, 100 lbs. of limestone. The charge is thrown in at the top. In a hilly district, such as that of Colebrook Dale, the furnaces are erected at the side of a hill, on the summit of which the charge is

prepared, and tossed into the furnace-mouth, as shown in Fig. 15. Near Dudley the charge is moved up an inclined plain by steam-power, or some other mechanical lift. The charge gradually descends until it reaches the upper part of the boshes. In the cone c, Fig. 11, the heat is not very great: near the boshes it is considerable, and in the hearth at its maximum; for it is here that the oxygen of the blast encounters the fuel, and produces the most vivid



Fig. 15.—MOUTHS OF BLAST-FURNACES.

combustion. About the middle of the boshes the heat is greatly diminished in intensity, since the oxygen, now converted into carbonic acid, and the nitrogen of the blast, escaping upwards towards the chimney, impart much of their heat to the fuel and mineral at the lower part of the cone. The carbonic acid, coming in contact with the heated fuel, becomes converted into carbonic oxide, with a great expansion of volume, and consequently a large absorption of heat. As the carbonic acid encounters the oxide of iron, it robs it of

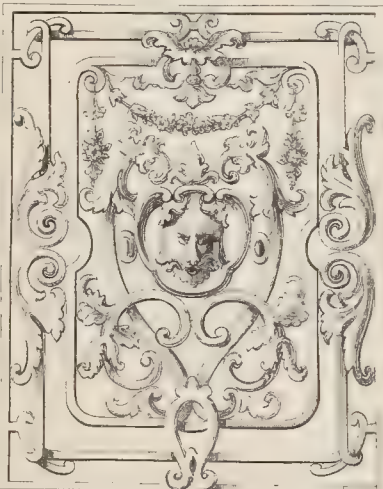


Fig. 16.—CAST-IRON OPEN PANEL FOR BALCONY, BY MESSRS. KINWARD

oxygen, reduces it to metallic iron, and becomes again converted into carbonic acid. The burning of the limestone also furnishes carbonic acid, while the dry distillation of the fuel in the upper part of the cone furnishes hydrogen and carburetted hydrogen. The moisture, too, which enters by the tuyeres is decomposed, and increases the quantity of carbonic oxide and hydrogen; so that, in addition to the unflammable nitrogen and carbonic acid which escape by the chimney, there is a vast amount of inflammable gaseous matter, which furnishes the great body of flame and smoke

already referred to. It has been proposed to employ the highly-heated gases which escape from the throat of the furnace for the purpose of heating the blast by which it is supplied, and also for the purposes of puddling, &c. The plan has been adopted to a certain extent, and the iron resulting therefrom has been called *gas-iron*. At the lower part of the boshes, where the temperature is very high, the lime of the flux and the ash of the fuel combine with the silica to form the various double silicates which constitute the slag. At this point the iron exposed in a slightly oxidising atmosphere to a very high temperature in the presence of carbon, a portion of that substance combines with the metal, and converts it into cast-iron. The iron and the carbon also reduce a portion of the silica, the silicium combining with the iron, and the oxygen of the silica with the carbon. When in this state the charge arrives at the upper part of the hearth, the intense heat produced by the action of the blast upon the remaining portion of the fuel completely fuses both the iron and the silicates, and they pour down into the crucible beneath, where the fused products arrange themselves in the order of their density, the iron at the bottom, and the silicates above, protecting it from further oxidation. The silicates or slag occupy five or six times the space of the molten iron, so that as it rises to the level of the dam-plate it overflows, passes down



Fig. 17.—IRON VASE, BY THE COLLEGE & DALE COMPANY.

the inclined plane to the ground, and when cold is broken up by means of iron levers and removed. At some works the slag is made to flow into iron waggons, whereby it is moulded into large blocks. In the course of about eight or twelve hours the furnace is tapped, and the liquid iron is drawn off, for which purpose a plug of clay, which closes a hole in the bottom of the crucible, is pierced with a long bar, certain channels having been previously prepared in the sand which composes the floor of the workshop for its reception. These channels mould the metal into semi-cylindrical bars, called *pigs*, united by one of larger dimensions, called a *sow*, the moulds being so arranged as to make the points of connection thin, so that the pigs may be easily broken off from the sow when the casting is cold. It is necessary to keep the blast-furnace constantly at work; for if it were once allowed to cool down, this huge and costly piece of apparatus would be ruined.

Six different kinds of pig-iron are found in the market; the first three, named Nos. 1, 2, and 3, are considered as *foundry metal*. They contain various amounts of carbon, No. 1 having the largest proportion—the effect of which is to furnish a soft iron, very fluid when melted, and hence valuable for small and ornamental castings; it also yields readily to the chisel. No. 2 contains less carbon, and is harder and stronger than No. 1, and is used for parts of machinery which require strength and durability. No. 3, or *dark*

RR

grey iron, contains still less carbon, and may be used either for the forge or the foundry. It is employed in heavy castings, such as tram-plates, shafts, wheels, cylinders of steam-engines, &c. The next quality is called *bright iron*, from its lighter colour and brighter lustre than the foregoing; it is used for large castings. A fifth variety is *mottled iron*, so called from its mottled grey and white fracture. It is too thick and brittle for the foundry, and its use is confined to the forge. The last variety is *white iron*, from its silvery white colour. It is too brittle for casting, and contains less carbon than any other variety of pig-iron.

The cast or pig-iron contains several impurities which render it brittle and incapable of being wrought into shape by the hammer. The impurities are chiefly carbon and silicium, with small portions of sulphur and phosphorus. The two former are got rid of by exposing the pig-iron to the oxidising influence of a blast of air under a high temperature, whereby the iron is converted into oxide, which forms first on the surface, and gradually penetrates into the



Fig. 18.—GARDEN VASE FROM THE IRON-FOUNDRY OF M. DCEZ, OF PARIS.

mass. The carbon of the iron reduces the oxide first formed, producing metallic iron and carbonic oxide gas. The silicium of the iron is similarly converted into silicic acid, which forms with a portion of the iron a fusible silicate of iron. When at length the whole of the iron is converted into a spongy mass of malleable iron and fusible slag, it is subjected to the blows of a heavy hammer, by which the silicates are pressed out. The sulphur and phosphorus are got rid of with greater difficulty; indeed, it is better to remove them previous to the smelting by carefully roasting the ore. But good iron can never be produced from ores which contain much of either of these two substances. The furnace employed for refining pig-iron is called a *fining-furnace*, or the *refinery*, in which the metal is melted and exposed to the blast of numerous tuyeres, after which it is allowed to accumulate in the crucible, and is then run off into a flat mould. It has now lost a good deal of its carbon and most of the silicium; it is hard and brittle, and its surface is covered with small blisters. It is now called *fine metal*; it is broken into

fragments, and the decarbonisation is completed in the puddling-furnace, shown in section and plan, Figs. 19, 20, 21, in which the hearth A, is of cast-iron covered with a layer of slag. It is heated by a fire at F, from which it is separated by a bridge b, and the draught is determined through the furnace by means of a chimney from 30 to 50 ft. high, furnished with a damper at the top, which can be raised or depressed by means of a chain and lever. The charge of fine metal is piled up on the hearth until it nearly touches the dome; a portion of rich slag and iron scales is added, the doors are closed, and the fire is allowed to play, upon the metal which in about

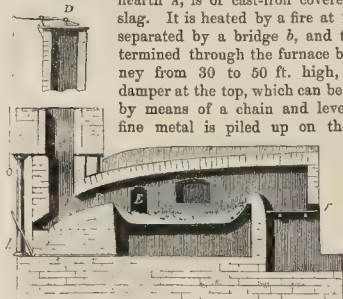


Fig. 19.—VERTICAL SECTION OF PUDDLING-FURNACE.

half-an-hour begins to melt and occupy the bottom of the hearth. The puddler then removes a small iron plate from the hole in the door D, passes in an iron rod, and stirs up the molten metal, so as to expose fresh surfaces to the oxidising influences of the draught. When the charge is reduced to a uniform pasty mass, the fire is lowered by gradually closing the damper; the metal, from the escape of carbonic oxide, appears to be boiling, and

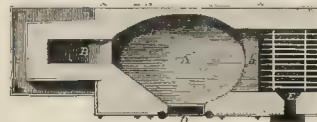


Fig. 20.—PLAN OF PUDDLING-FURNACE.

the gas burns at the surface with its usual blue flame. In this state the metal is kept in constant agitation by means of an iron paddle, until at length it loses its consistency and becomes sandy, or, as the workman calls it, *dry*. When carbonic oxide ceases to be evolved, and the metal has become uniformly granular, the heat is increased until the sandy particles begin to agglutinate. A portion of the slag is run off down B, and allowed to escape by a floss hole at h; the man then proceeds to *ball up*, or to form the iron into balls, by attaching a small portion of the metal to the end of his paddle, and rolling it round, when other portions of the metal



Fig. 21.—PUDDLING-FURNACES.

weld on to it. When he has formed a ball of 60 or 70 lbs. weight, he detaches it from the paddle, and proceeds to form a second ball. When the whole of the charge has been balled, it is moved to the hottest part of the furnace, and the heat is increased so as to weld the particles together. Each ball is then lifted out of the furnace by means of heavy tongs, and conveyed to the shingling hammer, which presses out the slag and consolidates the metal. The operation of puddling occupies about two and a half hours. The shingling hammer (Fig. 22), is of cast-iron, about 10 feet long, and the helve weighs from 3½ to 4 tons. The axis a, rests on heavy blocks, secured by strong bolts passing through courses of wooden beams into a foundation of masonry. The head H, is of wrought-iron faced with steel, and weighs from 7 to 8 cwt. The pane of the hammer p, as well as that of the anvil, is

formed into a series of grooves in order to nip the ball better. The face of the anvil is supported on a block of iron *i*, of about 4 tons weight. The head is raised by the cams *c*, fixed in the collar *B*,

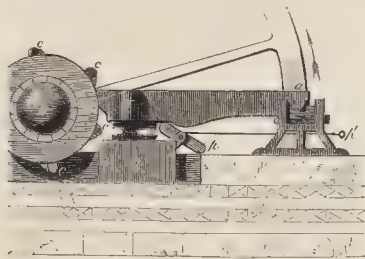


Fig. 22.—SHINGLING-HAMMER.

attached to a powerful shaft *s*, which is turned by steam or water power, regulated by a heavy fly-wheel which moves in the direction of the arrow. The hammer makes from 75 to 100 blows per minute, and when it is desired to suspend its operations, the rod *p* is pulled, which brings the prop *p* into a vertical position, so as to free the hammer from the cams. Instead of the hammer, a squeezer, consisting of a powerful pair of iron jaws, has been proposed. Nasmyth's steam-hammer has also been applied.

When the slag has been pressed out of the bloom by a few blows of the shingling-hammer, it is passed between rollers, *R R'* (Fig. 23), which serve to compress and weld the parts together, squeeze out the last portions of slag, and to draw out the iron bars. The rolls are mounted in pairs in a massive iron frame *uu*, connected by heavy couplings *de*, the distance between the rolls being regulated by screws *ss*; motion is imparted to the rolls by means of strong toothed wheels *cc*. Below the frame is a water channel, for the reception of the scale which falls from the surface of the hot iron

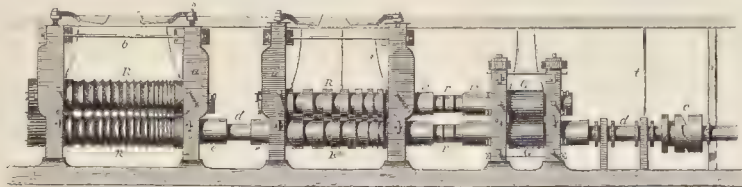


Fig. 23.—ROLLS.

while passing through the rolls; and the rolls are kept cool by a stream of water playing upon them from a pipe *t*. Two sets of rolls are usually employed, the one called *roughing* rolls, which prepare the iron for the *finishing* rolls; each roller has a series of from 5 to 7 regularly decreasing grooves of an elliptical form; the first three or four grooves of the roughing rolls are notched, to enable the iron to pass through without slipping, and on a level with the bottom of the notches on the lower roll is an iron *apron*, for supporting the balls or masses of iron.

The iron thus prepared is hard and brittle, and subject to flaws. Railway bars are formed in this way, by passing the bloom of puddled iron through grooved rollers of the section of the intended bar. A better quality of bar-iron is prepared by cutting up the

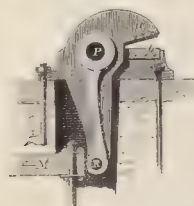


Fig. 24.—SHEARS.

bars from the roughing rolls by means of the shears, Fig. 24, consisting of two jaws with cutting edges *ab* of hardened steel, the upper blade moving on a stout pin *p*, attached by a lever *p R* to a rod *R M*, which is connected with the moving power. Bars of iron an inch or more in thickness are cut through with these shears with as much apparent ease as one may cut a piece of card with a pair of scissors. A number of short lengths of iron are *piled* or *fagoted* together, and a number of *fagots* are arranged a short distance apart on the hearth of a

reverberatory furnace, which is similar to the puddling-furnace, only the grate is larger. When the *fagots* are at the proper welding heat they are taken out one at a time, and passed rapidly through the finishing grooves of the section required. Sheet-iron is made by passing the metal between smooth-faced rollers, which are gradually screwed nearer together until the required thickness is attained. Some sheet-iron exhibited at the Breslau Exhibition, in 1852, was only about 1-250th of an inch in thickness. An album was exhibited of this leaf-iron, in which the iron pages turned as flexibly as those of paper—indeed it was proposed to print on it for the tropics, in order to make books secure from the ravages of the white ant.

By *fagoting* and rolling out the iron in the manner indicated, the crystalline character of cast-iron becomes exchanged for the fibrous texture of wrought-iron. In rolling flat bars the layers of the pile are kept horizontal, in order that the fibres may be straight and parallel. A good blacksmith always attends to the direction of the fibre, for by so doing he increases the strength and toughness of his forged goods.

Bar-iron is known in the market as *common iron*, *best iron*, *best-best* or *chain-cable iron*. Particular kinds of iron are manufactured for special purposes, such as for gun-barrels, recognised as *stub-iron*, *stub-twist*, *wire-twist*, *Damascus-twist*, *stub-Damascus*, and many other kinds. Stub-iron is formed from old horse-shoe nails, called stubs—a form of iron which has attained to many excellent qualities by being repeatedly worked. Stubs are packed closely together, bound with an iron hoop into a ball, raised to a welding heat, and drawn out into bars, which are used for locks, furniture, and breechings of the best guns, and to some extent for barrels. Nails are imported in large quantities for this manufacture; they are polished in a rapidly revolving drum, sifted from dust, sorted, mixed with fragments of steel, *fagoted*, and converted into a bloom as before, which is drawn out under a tilt-hammer into bars of the proper size to pass through the rollers, which further reduce it to rods of the required size. A very tough iron is thus produced. Stub-barrels are also made from *scrap-iron*, a name given to the

cuttings and punchings of sheet-iron, worn-out articles in iron, and the waste cuttings of various manufactures. They are sorted for the various qualities of iron, known as *wire-twist*, *Damascus-twist*, *stub-twist*, *charcoal-iron*, *threepenny-skelp-iron*, *twopenny* or *Wednesday-skelp*, *sham-dam-skelp*, &c. Scrap is cut into small pieces, so as to cross and interweave the fibres, and increase the tenacity. The steel which is puddled in with the iron readily unites with it, and it improves the beauty and variegation of the twist. For twisted barrels, the iron is drawn out into ribbons, and these are wound while red-hot, and twisted spirally round an iron rod (Fig. 25), raised to a welding heat, and struck or jumped on the ground so as to unite the edges, the welding being completed by hammering on the anvil.

Fig. 25.

Wire-twist and Damascus-iron are obtained by welding alternate laminæ of iron and steel, or iron of two qualities, and drawing the compound bar into ribbons.

Bar-iron is subject to two defects, which give it the name of *red-short* and *cold-short*. In the one case, it cracks when bent or punched at a red heat, although tenacious when cold; while cold-short-iron is weak and brittle when cold, but can be worked without difficulty when hot. A minute portion of sulphur is said to be the cause of the red-short property of wrought-iron, while phosphorus is said to make iron cold-short.

Manufactured iron is never free from carbon and other substances, but the carbon appears to be only mechanically mixed with the metal: the chemical union of less than one half per cent. of

carbon develops those remarkable properties which distinguish steel from iron, making it so hard that it will cut and file iron with ease, enabling it to scratch the hardest glass, and strike sparks with siliceous stones. Steel is denser than iron; it has a finer grain; a brighter and whiter lustre when polished; is more elastic; retains magnetism more permanently, and does not rust so readily. When heated in contact with the air, it assumes various tints which serve as useful guides to the manufacturer; and it possesses the invaluable property of being hardened and tempered to any degree required in the arts.

The iron used in the manufacture of steel is that which has been smelted with charcoal. It is imported from Sweden and Russia, from Madras, and it is also manufactured in small quantities at Ulverstone. The foreign iron is imported in bars impressed with certain distinguishing marks. The most celebrated Swedish iron is from the Dannemora Mine, the ore of which affords a white crystalline brittle cast-iron; it is converted into malleable iron by heating it in a bed of charcoal, and hammering it out into bars. This iron is known in England by the name of *Oregrund* iron, from the name of the Swedish port at which it is shipped. It is known by the marks *hoop L*, from the letter L being inclosed in a hoop; the *GL*, and the *double-bullet*. Other varieties of Swedish iron are known by the marks *C* and *crown*, *D* and *crown*; the *Steinbuck*, and the *w* and *crowns*. All these marks are shown in Fig. 26.

Steel is manufactured in England by the process of cementation. The cementing furnace, shown in section Fig. 27, resembles a glass-



Fig. 26.

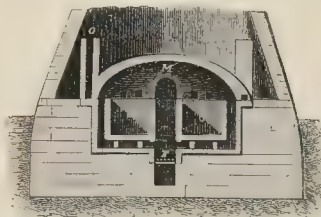


Fig. 27.—SECTION OF CEMENTING FURNACE.

house, and consists of a cone or hood, 30 or 40 feet high, which serves to shelter the furnace, and to carry off the smoke of the fuel. The furnace contains two chests or troughs *C*, made of fire-tiles or fire-stone bricks, and capable of holding from 8 to 12 tons of bar-iron. The troughs are heated by means of the fire *F*, the heat being distributed round the troughs by means of holes in the flues *o o*. At *M* is an opening by which the workman enters the furnace to charge the troughs. The preparation of the charcoal, or cement, as it is called, varies with different steel converters. The dust of charcoal made from hard wood is preferred, soot is sometimes employed, as also a small proportion of ashes and common salt. The cement is sifted into the troughs to the depth of two inches, the bars are put in upon their narrow edges, with the space of about half an inch between every two bars; powdered charcoal to the depth of an inch is then sifted in, and a second set of bars is made to fit into the interstices of the first; in this way the troughs are filled to within 6 inches of the top. The filling is then completed with old cement-powder, and this is covered with damp sand or fire-tile, in order thoroughly to exclude the air. The furnace is then closed up, and the fire is lighted and urged for a few days, until the proper cementing temperature is attained; and this is kept up for several days, until the iron has absorbed sufficient carbon to produce the kind of steel required. For some purposes the bars are exposed to two or three successive cementations, and are then said to be twice or thrice converted. In the centre of each trough is a small hole called a *tasting-hole*, corresponding with a small iron door in the outer brickwork, by which the man can draw out a bar, and watch the progress of the cementation, which is judged of by the surface of the bar being covered with blisters, whence the name of *blistered steel*. When the transmutation is complete, the fire is extinguished, and the furnace is left to cool for a week.

The steel thus produced presents some remarkable differences from the bar-iron. It is covered with blisters; its texture is no

longer fibrous, but granular or crystalline. The colour of the fracture is white like frosted silver, and the crystals are large in proportion to the amount of carbon absorbed. In this condition the steel is generally unfit for forging until it has been condensed and made uniform, which is the object of the process of *shearing*, or

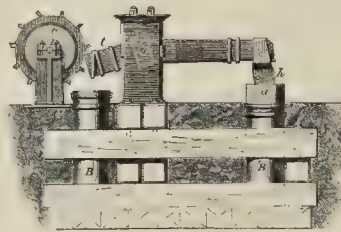


Fig. 28.—TILT-HAMMER.

making *shear-steel*, so called from its having been originally employed in the manufacture of shears for cutting off the wool from sheep. The operation is performed by means of a tilt-hammer, Fig. 28, in which the coze of a wheel *C*, are made to act on the tail *t* of the hammer *h*, pressing it down, and so raising the head of the hammer; thus producing a rapid succession of blows on the anvil *a*, varying from 150 to 360 strokes per minute. The steel bar is broken into lengths of about 18 inches, and four or more of these are bound into a *fagot* by means of a ring, an iron pole being used for a handle, as shown in Fig. 29. The *fagot* is raised

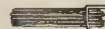


Fig. 29.

to a welding heat, and sand is sprinkled over it, which, combining with the small portion of oxide of iron which forms on the surface, produces a fusible slag, which protects the metal from wasting or burning away. The heated *fagot* is first subjected to the action of a forge-hammer, which unites the fragments. The rod thus formed being again heated, is subject to the rapid blows of the tilt-hammer by a workman who is seated in a kind of swing, where, by the motion of his foot on the floor, he can shift his position with ease and rapidity. The rod soon ceases to be red-hot; but the rapid blows of the hammer revive the redness, and it is remarkable to see it ignite under the action of the strokes. In this way a rude steel rod becomes stretched and formed into an even, smooth, sharp-edged prism, fit to be forged with the hammer into shears, edge-tools, and cutting instruments. The steel increases in value with the amount of tilting, so that a tilted bar is again made up into a *fagot*, and elongated as before. The terms *double shear*, *single shear*, and *half shear*, serve to express the amount of labour bestowed on the metal.

Steel is produced in greatest perfection by the operation of casting, in which case the bars of blistered steel are broken into fragments, melted in crucibles, and cast into ingots. The crucibles are made chiefly of Stourbridge clay, mixed with Stanington clay, a small quantity of coke-dust, and fragments of old pots. The whole being mixed with water, and worked up, is kneaded on the floor during five or six hours by the naked feet of men, who keep incessantly tramping upon it with a shuffling kind of motion, folding it and treading it out over and over again. The crucibles are about 2 ft. in height, and of the shape shown in section in Fig. 30. They are formed in a cylindrical mould of cast-iron *a a'*, Fig. 31, open at the two ends, and inserted into a block of cast-iron *b b'*, with a supporting rod for the inner mould *c*, which is a block of hard wood,

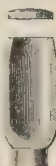


Fig. 30.

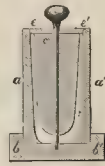


Fig. 31.



Fig. 32.

supported at top by the cover *e e*. The surface of *c*, and the inner surface of *a*, are smeared with oil, the kneaded clay is then put into *a*, and the central plug *c* is forced down by hand as far as it will go (see Fig. 31): it is then driven in by means of a hammer, until the lower end of the axis enters the sole in the hole *b*. The central plug *c* is then pulled out, and the hole in the centre stopped up. The outer mould is then lifted upon a block of wood mounted upon

a stout iron rod, Fig. 32, and the outer mould *aa* is carefully removed. The clay-pot is now finished by hand, and is pressed slightly inwards at the top; it is furnished with a cover of clay, and a cylindrical block for it to rest on. It is next removed to a heated vault to dry, and is afterwards annealed at a red heat. The steel is melted in an ordinary wind furnace, heated by dense well-made coke, and capable of holding two crucibles, so that it is usual to have a row of these furnaces side by side. The crucibles are lined with a plaster made of road-dust, called *ganister*. The charge of steel for each crucible is about 30 lbs., with a small portion of black oxide of manganese, or powdered charcoal. The charge is given to each crucible by means of a long funnel of iron plate (Fig. 33), let down into the fire through a trap-door over each furnace; an iron rod is inserted in the funnel, in order to prevent the charge from falling at once into the crucible, and fracturing it. The



Fig. 33.

pots after each charge are well covered in, and the furnace is kept well supplied with fuel. In about four hours the steel is sufficiently fluid for casting; but during this time the ingot moulds are prepared. Each mould consists of two parts, fitting accurately together, and held by iron clamps, Fig. 34, placed in a shallow pit in the floor of the casting-house. Before putting the halves together, the interior is smoked at a pitch fire, to prevent the liquid steel from adhering to or melting the mould. Prior to drawing the crucibles the man puts on sacking leggings and a coarse apron, which he saturates with water to prevent them from taking fire while he is standing over the ardent furnace. Throwing open the trap-door of one of the furnaces, and striding across the opening, he thrusts down a pair of tongs with concave jaws, and grasping the crucible, raises it to the floor of the casting-house,

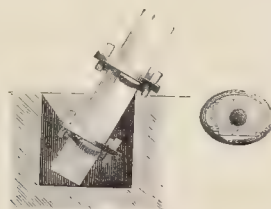


Fig. 34.

where a second man removes the cover, and a third grasps the crucible with tongs held horizontally, and pours the contents into the mould. The metal flows as liquid as water, and with a gurgling sound. The very high temperature of the molten steel is evident by the white heat, slightly tinged with blue. As the stream is falling, minute portions of it are seized by the oxygen of the air, and burn with brilliant scintillations. When the mould becomes full the end of the ingot even takes fire, and burns like a firework, but the combustion is stopped by the insertion of a solid plug. The ingot immediately solidifies, and is removed from the mould. Fig. 35 shows the interior of a casting-house, drawing the crucibles,



Fig. 35.—INTERIOR OF A CASTING-HOUSE.

and casting. The second man who attends the casting is furnished with a pair of tongs for removing portions of cinder or slag from the surface of the metal. Fig. 36 shows the interior of the casting-house, and of the air vault below it, with a couple of crucibles in the furnace; a portion of the tall chimney which produces so powerful

a draught is also shown in section; on the shelves of the casting-house green crucibles are arranged for the purpose of drying.

Cast-steel is denser and harder than tilted-steel, but requires care

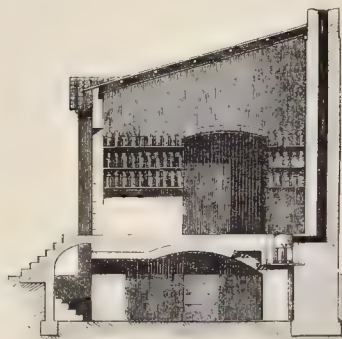


Fig. 36.—CASTING-HOUSE AND AIR VAULT.

in the forging, on account of its brittleness a little above a cherry-red heat. Two surfaces of cast-steel may be welded together by interposing a thin film of borax: cast-steel may also be united to a polished surface of iron by placing it in the mould into which the steel is poured: the two metals can then be rolled and worked together into rods adapted for forging. Fig. 37 shows the operation

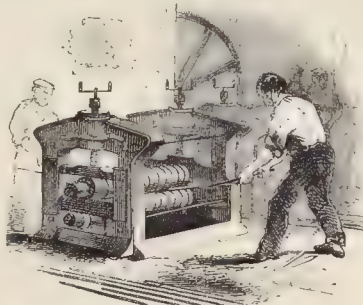


Fig. 37.—ROLLING STEEL.

of rolling steel. The rolls used for steel give it chiefly a round, half-round, or triangular section; but the tilt-hammer is greatly preferred.

In the manufacture of that large and miscellaneous collection of articles included under the term cutlery, steel alone should be employed—at least, as far as respects the working parts of each instrument. Unfortunately, the love of cheapness has led to the use of pig-iron in the manufacture of knives, forks, razors, &c., the effect of which is to lower the high character of this country for its cutlery which it has hitherto maintained abroad. The conscientious manufacturer, however, uses common steel, or shear, or cast-steel. Shear-steel is plastic and tough, and is used chiefly for making edge-tools, which require great tenacity without much hardness—such as table-knives, scythes, plane-irons, &c. Articles which require a very fine polish—such as razors, scissors, penknives, &c.—ought to be of cast-steel in the cutting parts, the rest of the tool being made of iron.

In the forging of small works two men are usually employed—the *fireman*, who manages the work in the fire and on the anvil, and the *hammer-man*, whose instrument is a sledge of from 10 to 14 lbs. weight, in the use of which he is directed by the fireman, who is furnished with a small hammer of from 2 to 4 lbs. weight. The hearth is raised about 2½ ft. from the ground, and is built hollow, with an arch beneath for the ashpit. The

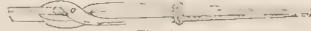


Fig. 38.

anvil weighs from 2 to 4 cwt. Small works are commonly forged from the end of a bar, called the *porter*: when the bar is too short to be held by the hand,

S S

or when the work has been cut off to be finished, it is held by *flat-bit* tongs, Fig. 38, or *crook-bit* tongs, Fig. 39, or common smith's



Fig. 39.

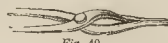


Fig. 40.

tongs, Fig. 40. The cutler is also furnished with chisels, punches, and swages, or *striking* tools, known also as *top* and *bottom* tools, for moulding or fashioning the work. The bottom tool usually fits into the square hole of the anvil by a tang, and the fireman placing the work upon it, and the top or rod tool above it, the hammer-man strikes the two together with his sledge, when the red-hot metal fills the cavities of the mould thus formed. The top tools are usually held by hazel rods, twisted like a rope, and held as in the figure (Fig. 41), which shows the position of the chisel cutting off the finished object from the bar.



Fig. 41.

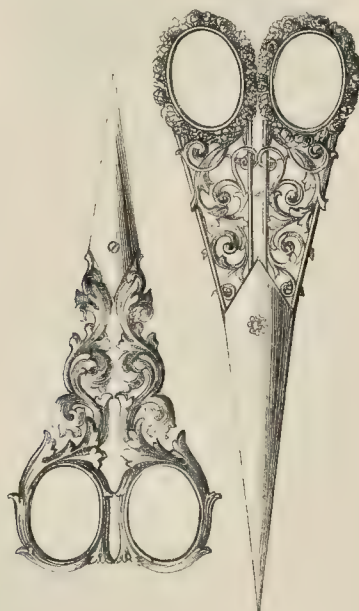
Most cases of forging may be comprehended under the two processes of *drawing down* or *reduction*, and *jumping* or *upsetting*, *thickening* and *shortening*: there is also a third process, known as *building up* or *welding*: in some cases all these methods are combined. A bar is reduced in thickness by the flat face of a hammer falling level on the work, as in Fig. 42, or for producing taper pieces, making it fall obliquely, as in Fig. 43. In forging a table-knife the blade is first produced at the end of a bar of shear-steel, and is then cut off: it is next welded to the extremity of a rod of iron about half an inch square, and a portion of this is cut off, sufficient to form the bolster, or shoulder, and the tang—a couple of swage tools being used for forming the shoulder. The blade is next heated a second time, and finished or smithed on the anvil: the maker's name is stamped upon it, and it is hardened by being raised to a red heat, and plunged into cold water: having been tempered to a blue colour, it is ready for the grinder.



Fig. 42.



Fig. 43.



Figs. 44, 45.

The valuable property possessed by steel of being hardened by sudden cooling is only equalled by another property, which enables it to be tempered to any degree of hardness required.

The effect of hardening is to make the metal brittle; the effect of tempering is to diminish the brittleness—and this is accomplished by again heating the article cautiously, and arresting it when the proper degree of hardness is attained. This is ascertained by the colour of a film of oxide, or a combination of carbon with oxygen on the surface of the metal, at temperatures not less than 430°. Where elasticity is required, as in springs for watches, gun-locks, &c., the steel is cooled or tempered as soon as it has assumed a fine blue. When a keen edge is required, as in razors, the edge is brought to a fine straw-colour, while the back is blue; for penknives the colour is a dark straw yellow; for chisels and shears for cutting iron the same colour, only darker; for axes and plane-irons a brown yellow; purple for swords and watch-springs, dark blue for small fine saws, and a paler blue for large saws.

Scissors vary as much as any other article in price and quality, from 3*d.* per dozen pair up to £10 10*s.* the single pair. The best scissors are of cast-steel, hardened in the blades, shanks, and bows: shear-steel scissors are the most common, and these have the blades only hardened. *Shot* scissors have steel blades and iron bows and shanks; large scissors, such as tailors' shears, are of this kind. The cheapest description of scissors are made of common cast-iron; while the most costly have their shanks and bows of gold, silver, &c. Figs. 44 and 45 are specimens of scissors by Mr. Thornhill, in the Italian style of ornamentation. Fig. 46 is a specimen manufactured by Mr. G. Wilkinson, of Sheffield, for the Indian Steel Company, showing much delicacy and elegance of design. The resources of Sheffield in this branch of Industrial Art may be judged of by the fact that a visitor to one manufactory alone was offered the means of examining 7000 executed designs.

In forging a pair of common steel scissors a single blade is formed at the end of a small bar of flat steel, and is then cut off, together with a portion of the metal sufficient to form the shank and the bow. A hole is punched through the projecting lump of metal for admitting the point of a small anvil or *beck-iron*, on which the bow is worked out with a hammer: there is a shallow groove in the *beck-iron* for moulding the inside of the bows. After being *lighted* or softened in the fire, the shape of the shank and the bow is improved by the file, the joint is squared, and the hole is bored and fitted for the rivet. The blades are now ground; the bows and ornamental works are smooth-filed, and burnished with fine emery and oil. As the blades are forged chiefly by eye, without reference to their being in pairs, they are now sorted into pairs, screwed together, and made to "walk and talk" well. The screw which unites the two blades consists of three parts of different diameters—namely, the *head*, the *neck*, and the *thread*: that part of the blade which receives the head of the screw is called the *shelf* or *twitter-bit*. The blades being put together, they are bound round with iron wire, the rivet is removed, and they are hardened. After this the blades are ground, and are again put together, and made to work properly. They are then rubbed up with fine emery and oil, the shanks are ground, and the whole glazed and polished. When put together again the edges are whetted, and the parts requiring it are fine-burnished with polished steel tools.

The blades of scissors are not made quite flat on their faces, but are sloped, each two or three degrees from the plane in which they move, so that their edges alone come into contact. This may be seen by holding up a pair of well-made scissors edgewise against the light, when it will be found that when shut the blades are not close together, except at the points and near the screws. The form

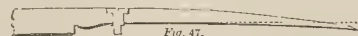


Fig. 47.

adopted resembles that shown in Fig. 47, the dotted line showing the direction of the blade if flat. Close behind the screw-pin is a small triangular elevation, called the *riding part*, one for each



Fig. 46.

blade: when the scissors are open to the full extent, the points only of the riding part come into contact; but as the blades are closed, the riding parts rub against each other, and tilt the blades beyond the central line of the instrument, by which means the edges of the blades are kept in contact throughout the length of the cut. If it were not for this contrivance the substance to be cut would fold down between the blades, especially if it were very thin; but when the edges are made to meet, each blade serves to support the material for the other to cut.

The grinding and polishing of cutlery is usually carried on at Sheffield in buildings called *wheels* or *mills*, each separate room being called a *hull*, and containing six troughs, with a grindstone and a polisher in each, steam power being employed to give motion to the stones. The stones vary in quality and size from 6 to 24 inches in diameter: they are fixed upon square iron spindles. The large stones are used for saws, fenders, &c., and the small ones for razors and general articles of cutlery. Saws, scythes, and edge-tools, are ground on a wet stone, for which purpose water is kept in the trough in which the stone runs. Numerous small articles—such as razors, scissors, penknives, forks, needles, &c.—are ground on a dry stone, which is more expeditious than wet grinding; but it is very injurious to the health of the workmen, in consequence of the fine particles of stone and metal filling the atmosphere, entering the lungs, and producing disease and death at an early age. By a proper system of ventilation, however, the evil may be remedied. Below each stone is a funnel connected with a central shaft, containing a revolving fan, which causes a strong current of air to flow down the mouth of each funnel, which hurries away the gritty and metallic particles as soon as they are produced, leaving the atmosphere of the place free from any perceptible dust.

In the manufacture of edge-tools grinding is an important process. The size of the stone determines the amount of concavity to be given to certain instruments, such as razors: a stone 4 inches in diameter gives the blade a corresponding concavity—namely, a curve of 2 inches radius, which curve will evidently produce a keener edge than can be given from a 6, 8, or 12-inch stone, since the smaller the diameter the more convex is the stone, and the more concave the blade which is ground upon it. The proportion between the width of the blade and the thickness of the back is such that when the blade is laid flat on the hone, so that the edge and back both touch it, an angle is obtained varying from about 17° to 20°. In the following figures the angle shown by the dotted line is 18°, and the concavity on each side of the razor is shown within this angle. The chief use of this hollowing out the sides is to avoid the necessity of sharpening the whole side of the wedge formed by the dotted lines, for it would evidently be more difficult to wear down the flat sides indicated by the dotted lines than the small portion thereof which is left; and if it were attempted, the edge would probably be rounded instead of flat. Fig. 48 shows the curve produced by grinding transversely on a

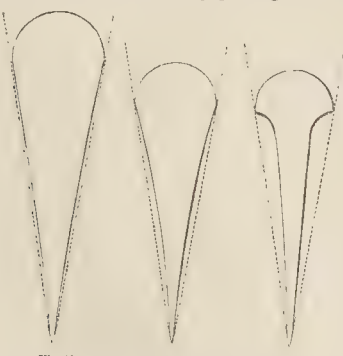


Fig. 48.

Fig. 49.

Fig. 50.

wheel of 12 inches, and Fig. 49 on a wheel of 4 inches, which give the two extremes of curvature. Fig. 50 is formed by grinding the blade lengthways on the stone, so that it may become nicked in, and produce any degree of thinness required. When this razor is used on a strong beard considerable vibration is experienced, whence the Sheffield cutlers term it the *rattler*. The *half-rattler* is formed

by nicking in the blade at about half its width. After the grinding of cutlery it is *lapped*, *glazed*, and *polished* on wheels called *laps*. The cutler's lap consists of a wooden cylindrical centre with a metal rim—an alloy of one part tin with four or five of lead being usually preferred. The surface is turned with a number of fine grooves for holding the dressing or head of emery and oil, and it is *finned* with fine emery, and friction with a piece of felt and a smooth flint, or a steel blade. A white colour is produced on steel by means of a coarse lap, and a heavy pressure of the work upon it; a black polish is produced with a fine lap and light pressure, gradually drawing the work from one end to the other. Wooden wheels, called *glazers*, are so arranged in six or eight pieces that the end grain of the wood may form the face. They are made of mahogany, walnut, oak, crab-tree, and birch, and are fed with emery cake. There are also polishing wheels of wood, covered with leather, and dressed with crocus.

The handles and hafts of the various articles of cutlery include a wide range of substances, the most common being elephant and walrus-ivory, German and Indian stag-horn, buffalo and cow-horn, tortoise-shell, mother-of-pearl, cocoa-wood, snake-wood, and other woods; stamped gold and silver, agate, &c., are also used. For

common knives and forks a flat piece of iron is continued from the blade, upon which flat pieces of bone ivory, or wood, are attached for the handle. A good method of securing a handle is to drill a hole completely through its length, to insert the prong, and rivet it at the opposite end—this is called *through-fang*. The usual method is to secure the prong in the handle by means of melted resin mixed with fine ashes or whiting, but such a handle readily becomes loose by contact with hot water. Balance handles are made by dropping in a piece of lead before the tang is inserted, so that the handle being heavier than the blade, and the latter being furnished with a projecting shoulder, it does not come in contact with the tablecloth when laid down. Messrs. Rodgers, of Sheffield, have contrived a method of fixing the blade in the handle which appears to be very effectual. It will be seen by Fig. 51 that, in addition to the hole for the reception of the tang, a slight recess is cut out on one side, into which the end of a small spring, secured to the tang, falls, and acting like a ratchet detent, effectually secures the handle to the blade.

Fig. 51.

The consumption of ivory at Sheffield is very large. It is cut up by means of a circular saw; the heat excited by the friction producing a strong ammoniacal odour. This reminds us that Sheffield is also the seat of the saw manufacture, and very interesting it is to follow the operations by which this important cutting instrument is produced. The qualities which distinguish a good saw are uniform thickness in the blade, and such perfect elasticity that on bending it into a bow it will return to a straight line on removing the pressure. These qualities, and those which constitute the excellence of cutting instruments in general, can be insured by employing the metal prepared from cast-steel. Indeed, it is scarcely possible to over-estimate the good effects of the method of preparing steel by casting; and among them not the least is the certainty with which the manufacturer can repeat his results, and produce from year to year identity in the excellence of his wares, thus maintaining the high character of his town all over the world. It is, however, to be deplored that competition, love of cheapness, refractory workmen, and other causes, tempt the Sheffield manufacturer to produce inferior descriptions of goods, the effect of which must be to make it anything but a compliment should some future Chaucer say of one of his characters—

"A Sheffield thwytel * bare he in his hose."

A saw-blade is cut out of a sheet of steel formed by rolling an ingot of the cast metal. The shears used for the purpose are firmly mounted, as shown in Fig. 52, the upper blade being raised and depressed with a long lever. The edges of the pieces are ground true, and the teeth are cut out by means of a punch at a fly-press, Fig. 53, which is a common form of press for cutting out works in metal. It consists of a body B, formed of a massive piece of iron, attached to a bed or base B'. The screw is of coarse pitch, with a double or triple square thread, the rise of which is about 1 to 6

* A case-knife or whittle, used for cutting food, &c.

inches in every revolution. It moves in a nut *n* of gun-metal, and is worked by means of an iron lever attached to the square head of the screw. The lever has a cast-iron ball at each end; the



Fig. 52.—CUTTING OUT THE BLADES.

lever and balls forming what is called the fly *f*; a handle descends from the lever to the level of the punch, so that the operator may work the press with his right hand, and feed it or manage his work with the left. The above press is not arranged for cutting the teeth

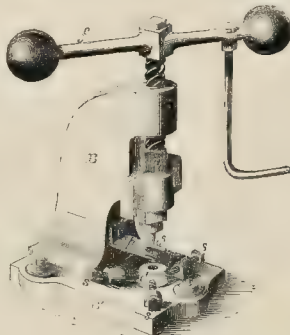


Fig. 53.—CUTTING PRESS.

of saws, but rather for punching out blanks from metal sheets, as in button-making, in which case the punch is attached to a square bar or follower, which fits into an aperture at the bottom of the screw. The bed or bottom die *d* is held in its place by four screws *s*; while a projecting piece *p*, called the *puller-off*, is used to detach the sheet of metal from the punch after every blow. In cutting out the teeth of a saw-blade, the distance between them is accurately regulated by means of a steel gauge by the side of the punch, so that by shifting the blade one tooth forward after the cutting of a tooth, the gauge falls into the space between two teeth. In cutting the teeth of long saws, the ends of the blade are supported by swing rests, suspended from the ceiling by cords. The forms of teeth are very various, the most simple being those produced by means of an equilateral triangular file, making angular notches in the edge of the blade, as shown at *b*, Fig. 54. In this case the teeth are said to have

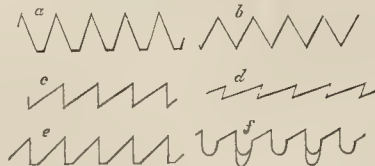


Fig. 54.

an *upright* pitch, although in fact there is no pitch at all; in *d* the teeth are said to be *flat*, or to have considerable pitch. Between these two extremes the inclination or pitch varies greatly. In general the angles of the points of the teeth are acute in proportion to the softness of the material to be sawed. In the above figure, *a* is

called the *peg-tooth* or the *feam-tooth*, and is very common. This, as well as *b*, is used for *cross-cutting* saws, or those which cut across the fibre. The *gullet-tooth* *f*, is also used for cutting timber across. It is called *gullet* from the large hollow, or *gullet*, cut away in front of each tooth in continuation of the face—an arrangement by which the saw is less disposed to choke than in the case of an angular notch. The tooth most generally used is *c*, and is known as the *ordinary-pitch*, or *hand-saw-tooth*. It is much used by cabinet-makers and joiners, and also for circular-saws for fine work. In some cases, instead of the acute angular notch continued to an internal angle, the form shown at *e* is adopted for some kinds of mill-saws. The various forms of the blade, and the methods of mounting saws, are exceedingly numerous, and do not come within our present object, which has chiefly to do with the manufacture of the blade.

After the cutting of the teeth, the wire-edges left by the punch are filed down, and the teeth are sharpened. The next process is hardening, for which purpose the saws are heated in long furnaces, and quenched in a bath of oil, in which tallow, suet, bees'-wax, resin, pitch, and some other substances have been melted. The saws are now very hard and brittle, and require to be tempered, for which purpose each blade is heated over a coke fire until the grease adhering to it from the bath ignites; this is called *blazing off*. Next comes the *planishing* or *smithing*, in which the saw is well hammered on an anvil of polished steel, for the purpose of equalising the internal texture. The blade is now ground at the wheel or grindstone, Fig. 55. The grinding is wet, and the saw is applied



Fig. 55.—GRINDING THE BLADES.

to the stone chiefly crossways, so as to reduce the thickness of the metal from the teeth towards the back; the blade is applied to the grindstone by means of a board, as shown in the figure. After the grinding, the saw is again planished to restore its flatness; its elasticity is imparted to it partly by this process, and partly by heating it over a coke fire until a faint straw colour appears on its surface. It is again passed lightly over the grindstone in the direction of its length to remove the marks of the hammer, after which it is smoothed on a hard smooth stone. Then comes the polishing on a block or glazer; and it is once more planished or *blocked*, as it is now called, the anvil being a block of hard wood. The saw is now taken in hand by women, who *clean off*, as it is called, by means of coarse emery rubbed on with a cork, so as to produce an even white level tint. Lastly the teeth have to be *set*, that is, the teeth are bent alternately a little on one side, so as to form an acute angle with the surface of the saw, to prevent them from becoming choked up with saw-dust, and also to give breadth for the working of the saw. In setting a saw the teeth are placed upon the rounded edge of a small anvil or stake, Fig. 56, and the saw-maker strikes every alternate tooth with a small hammer, so as to bend it round the curve. Half the teeth being thus slightly bent, the saw is

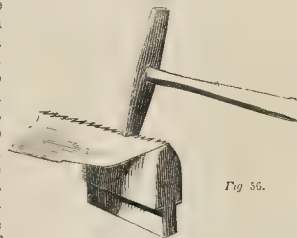


Fig. 56.

turned over, and the intermediate teeth are similarly treated. The operation is performed with great rapidity and dexterity, always exciting the surprise of the uninitiated, who, were they to attempt the operation, would certainly break off the teeth instead of setting them. Hence when amateurs wish to set their own saws, they provide themselves with *saw-set pliers*, by which the operation may be as effectually, although much more slowly, performed as by the hammer of the saw-maker.

We have written above "*lastly* the teeth have to be set;" there are, however, several other operations before the saw is finished. In general we do not sufficiently consider the large number of apparently insignificant processes which are necessary to the perfection of articles in common use; and we may be sure that if an article attracts by extraordinary cheapness, it is either made of inferior material, or some of the finishing processes which impart excellence to it have been omitted. After the setting, the saw is placed in a vice between slips of wood or clamps of sheet-lead, and the teeth are filed up sharp, the usual unpleasant screeching noise being greatly lessened by thus securing the blade. The saw is again tempered, and the thin film of oxide is washed off with very dilute muriatic acid. A beech-wood handle is next fitted on, and this is worked up with files and rasps, and polished with a whale-fin and a bone burnisher. The back plate when required is also fitted; this is a piece of iron folded together so as to form a groove, and it clasps the back of the saw like a spring, and keeps the blade perfectly straight.

Sheffield is a great place for files. The production of this useful tool involves a number of curious processes, and shows an amount of manual dexterity which is not excelled in any other department of mechanical art. The file itself, too, is so variable in size, in form, and in character of tooth, as rather to resemble a natural than an artificial production. Indeed, in treating on this subject we are almost tempted to write a monograph, after the fashion of naturalists, giving first a description of the type of our *lima* or file, then arranging or grouping it into families, and going into details respecting individual species. Thus files may be distinguished as *taper*, *blunt*, or *parallel*, the first kind being the most numerous; they taper in length, and terminate nearly in a point. Blunt files are parallel, or nearly so, but both kinds are somewhat arched or convex towards the middle. Those files which have an equal section throughout are called parallel, but even in these it is not uncommon to make them slightly fuller in the middle. Files may vary in length from $\frac{1}{2}$ of an inch to 2 or 3 ft. Files are again distinguished as Sheffield-made and Lancashire-made—Warrington in Lancashire being the seat of the latter, which consist of the finer varieties, such as are used by watch and clock-makers, mathematical instrument-makers, &c. Files may also differ in the form and size of their teeth. When these are produced by two series of straight chisel cuts, crossing each other so as to raise on the surface an immense number of points, the file is said to be *double-cut*; but if the teeth consist of ridges produced across the file by one series of straight chisel cuts, the file is *single-cut*, but in such cases it is technically called a *float*—the word file always being referred to double-cutting. When the teeth are formed by dotting the surface of the steel with an elevation and a corresponding depression, produced by a pointed chisel or punch, we have neither a float nor a file, but a *rasp*. Floats and rasps are commonly used for abrading woods and soft materials: double-cut files are employed for metals and for general purposes. Then again, double-cut files are distinguished according to the fineness of the teeth, as *rough*, *middle-cut*, *bastard*, *second-cut*, *smooth*, *superfine*. This is a Lancashire arrangement; the Sheffield classification consists of *rough*, *bastard*, *second cut*, *smooth*, *dead-smooth*. In a Lancashire superfine cut file, 4 inches long, a rough-cut contains 56 cuts to the inch, a bastard 76, a smooth 112, and the superfine 216. Floats and rasps are distinguished as coarse and fine. In most files the central line is straight, but in some few, as in the *rifflers* used by sculptors and carvers, it is curvilinear. Files that are used for making a set-off or shoulder, or for filing out rectangular corners, have one or more of their edges left uncut or *safe*, as they are called. With respect to the forms of files, they may all be derived from the *square*, the *circle*, or the *triangle*, as shown in Figs. 57, 58, 59, and they often derive their names from their sections, such as *square*, *round*, and *half-round*. Other files are named from the uses to which they are applied, as *saw-files*, *slitting*, *rounding*, and *cotter* files. *Taper* files or *taper-flat*

files are in very common use among smiths and mechanics; they are rectangular in section, as in No. 2, but considerably rounded on their edges, and somewhat also in their thickness, and are hence

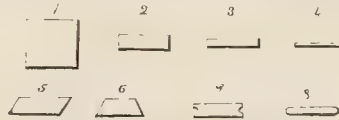


Fig. 57.—SECTIONS OF FILES DERIVED FROM THE square.

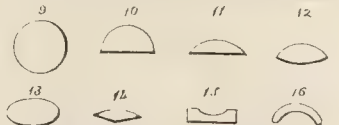


Fig. 58.—SECTIONS DERIVED FROM THE circle.

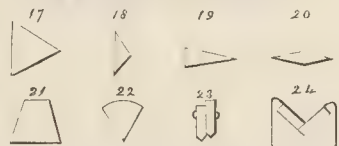
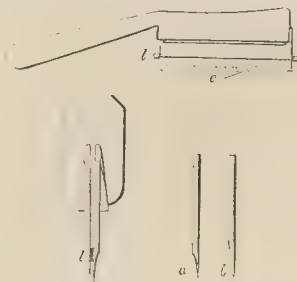


Fig. 59.—SECTIONS DERIVED FROM THE triangle.

said to be *bellied*. *Hand* or *flat* files, on the contrary, are nearly parallel in width, and nearly flat; they are commonly used for flat surfaces. *Cotter* files are narrower than hand files, and nearly flat on the sides and edges; they are used for filing grooves for the *cotters*—keys or wedges—used in fixing wheels on their shafts. *Taper cotter* or *entering* files taper in width and thickness. *Pillar* files, Section No. 3, are thinner than hand files, and are used for lighter work; they have usually one safe edge. *Half-round* files, Section No. 11, may vary from the fourth to the twelfth part of the circle, the former being called *full* half-round, and the latter *flat* half-round files; the convex surface is used for hollow work, and the flat side for general purposes. *Triangular* or *three-square* files, No. 17, are used for internal angles, for clearing out square corners, and for sharpening saws. *Cross* files, *crossing* files, and *double half-rounds*, No. 12, have circular faces of different curvatures, and are used for filing out the crosses or arms of small wheels in clock-work, &c. *Round* files, No. 9, are usually taper, and are employed for enlarging round holes; when small and taper they are named *rat-tail* files; when small and parallel they are called *joint* files, from their use in filing the hollows in the joints of snuffboxes, &c. *Square* files are mostly taper, and sometimes have one safe edge; they are used for small apertures. *Equaling* files, No. 4, are parallel in thickness, and usually so in width. In locksmiths' *ward* files the two broad surfaces are left safe. *Knife* files, No. 19, are used in cutting narrow notches, in bevelling or chamfering the sides of narrow grooves, and in making an entry for saws and larger files. *Slitting* or *feather-edged* files have two thin edges, as in Section 20. *Rubbers* are strong heavy files used for brightening the surface of work; square or triangular, as No. 1 and No. 17, or with one side rounded, such as would be formed by the juncture of Nos. 2 and 10, which are termed *half-thick*.

The small files used in watch-making are numerous, such as *verge* and *pivot* files, Section No. 2; *pottance* files, No. 3; *clock-pinion* and *endless-screw* files, No. 4; *French-pivot* and *shouldering* files, No. 5 and 6; *nick* and *piercing* files, No. 11; *oval-dial* files, No. 13; *balance-wheel* or *swing-wheel* files, No. 14. Such forms, when of large size, are also used in other departments of Art. No. 7 is a flat file with hollow edges, used as a *nail* file for the dressing-case. No. 15 is a *swaged* file for finishing brass mouldings. No. 16 is Sir John Robinson's *curvilinear* file. No. 18 is a *cant* file for the insides of spanners for six or eight-canted bolts and nuts. No. 21 is used in finishing small grooves and key-ways; it is also named a *valve* file. No. 23 is a double or chequering file, used by cutlers, gun-makers, &c. Its use is similar to that of the comb-cutter's saw or *stadda*, as it is called, Fig. 60, which consists of two saw-plates ground away on the edge, as at *a* or *b*, as thin as the notches in the comb; and the plates being fixed in two grooves of a stock, separated by a strip of metal called a *languid*, l

of the thickness of the teeth required in the comb *c*. For every tooth cut a notch in advance is made, so that the action of cutting out one tooth scores out a place for the saw for the next adjacent tooth; and thus the teeth of combs are cut with so much regularity.



Ratchet bars for air-pumps are cut by a similar contrivance. No. 24 is a *double* file, formed by fixing two flat files in a wooden stock, and is used for bringing black-lead pencils to a fine conical point.

Good highly converted steel must be used for forging files: the metal must not be too soft, or the file itself would be worn instead of the surface operated on; nor must it be too hard, or the teeth will be brittle and chip off at every stroke. Smiths' rubbers are forged square from the bars of steel as they leave the converting furnace; smaller files are forged from bars or rods, tilted or rolled as nearly as possible to the sections required; files of the best quality are made from cast-steel. In forging, the *striker* has a large double-handed hammer, with a broad face at either end; but the *maker's* hammer is smaller and single-handed, somewhat conical in shape, the face being formed by the wider end. *Three-square* and *half-round* files are forged in grooved bosses, or dies fixed in the anvil. The end of the rod of steel is raised to a blood-red heat, and hammered so as to fill the die, the maker holding the



Fig. 61.—FORGING FILES.

die, and the striker dealing powerful blows upon the heated metal. The blank being thus forged to the proper length, a tang is drawn out, and the maker's mark or monogram is stamped on it. Blanks for round files are formed in a slightly conical swage; blanks for flat and square files are formed by hammering. After the forging, the blanks are annealed or *lighted*, to make the metal sufficiently soft for cutting the teeth; the surfaces are then brought into form and cleaned by *stripping* or *grinding*—the one being done by means of a hard file, and the other, for larger files, on a grindstone. In a few cases the blanks are planed in the planing-machine.

The teeth are cut by means of a chisel held in the left hand at an angle of about 55° with the central line of the file, as at *a a*, Fig. 62, and inclining about 12° or 14° from the perpendicular, as in Fig. 63. The blow upon the chisel drives the latter a short way into the steel, and throws up a small ridge or *burr*. The man slides the chisel away from him until he meets this burr, which serves as a guide to the next blow. In this way the teeth are cut with great rapidity and precision, from 60 to 80 cuts being made in one minute, care being taken to make the blows of equal force. When

the whole length of the file has been thus cut, or the *first course*, as it is called, has been completed, that face is finished, if the file is intended to be single-cut; but if, as is generally the case, the file is intended to be double-cut, the man alters the position of his

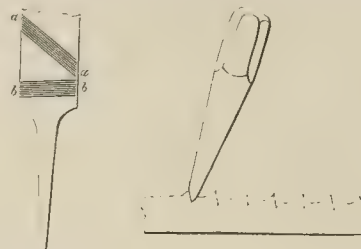


Fig. 62.

Fig. 63.

chisel by placing it only from 5° to 10° from the central line, as at *b b*, Fig. 62; and he proceeds with the *second course*, taking care to strike with less force, so as scarcely to reach the bottom of the first cuts. In taper files the teeth are made somewhat finer towards the point, to prevent the blank from being weakened or broken by so much hammering. In cutting rasps a punch is used, with which the workman hops over the interval between every two teeth with great rapidity, the directions of the teeth being made to vary according to the purpose to which the rasp is to be applied. Cabinet rasps, wood rasps, and farriers' rasps, are cut in lines, which slope from left to right; boot and shoe last-makers' rasps slope the reverse way; gun-stockers' and saddle-tree makers' rasps are cut in circular lines, the chief point being to make each tooth occupy a position intermediate between the two above it—for if the teeth followed each other in right lines, they would plough up the work instead of reducing and smoothing its surface.

Fig. 64 shows the file-cutters' bench, with the method of securing the file by means of a strap passing over each end of the file and



Fig. 64.—CUTTING THE TEETH.

under the feet of the workmen, after the manner of stirrups—the file resting meanwhile on the anvil in a bed of lead and tin, which preserves the finished work from injury. The hammer weighs from one to six pounds, according to the size of the file; it is conical in shape, with a handle near the smaller end of the truncated cone. The round and curved surfaces of files are cut with a straight-edged chisel, as in the case of flat files, many rows of short cuts being made from top to bottom of the file, which cuts, uniting together at their extremities, form a complete series of lines round the cylinder or half cylinder. In fine round files, from 10 to 20 rows of cuts are required to cover the surface with teeth; and as there may be upwards of 100 teeth within the space of an inch, many thousand blows are required before a fine file can be supplied with teeth. In some double-cut gullet-tooth saw files, Sect. No. 10, Fig. 58, as many as 23 courses of cuts may be required for the convex face, and only 2 courses for the flat one. Attempts have been made to cut files by machinery, but not with much success—

machine-made files not having the *bite* of hand-cut files, which has been accounted for by supposing the human wrist to accommodate itself to the peculiar angle best adapted to the required cut, and to accommodate the blow to those variations which occur in the quality of the metal.

In the Great Exhibition of 1851, a remarkable specimen of file-cutting was exhibited, forming as it did one of those show specimens which artisans so much delight in, and which often, at the same time, exhibit exquisite workmanship and much bad taste: thus we may often see a cutler's shop-window made conspicuous by a gigantic razor, or a carving-knife and fork which remind one of a dinner-table in Brobdiagnag; or admiration is sought for at the other extreme—scissors being made so small that a multitude may be encased in a cherry-stone—so small indeed that their utility would not be recognised in Lilliput; not that we object to show specimens, only we wish to insist upon the abolition of monstrosities and littlenesses, and claim for the intelligent artist beauty of design, the best workmanship, and utility. We do not admire mere *tours de force* or *tours de main*; a landscape etched on the blade of a razor, or the Crystal Palace represented in file-cuts on a bar of steel, however difficult in execution, must always be offensive in effect, and therefore to be avoided. The Sheffield Great Exhibition file was 54 inches in length, 3½ inches in breadth, and ½ of an inch in thickness; its weight about 28 pounds. It was double-tanged, and on the two faces of one tang were cut the national arms, and the Cutlers' Hall, with the town motto, "*Pour parvenir à bonne foy.*" The two faces of the other tang represented Atlas supporting the globe, his feet resting on two lions couchant, beneath which were the Sheffield arms, surrounded with horns of plenty: also the cutlers' arms, with suitable emblems. On the moulding was cut, "Designed and executed by Hiram Younge, a member of the Sheffield file trade." On one face of the blade of the file the Crystal Palace was represented, and on the other face the Sheffield Infirmary. There were also groups representing the forging of files, the grinding, the cutting, hardening, and scouring. It is but fair to state that this kind of skill is held in such estimation, that Mr. Younge was sent for by a file-making establishment in Saxony, to execute a file with the Palace of Potsdam and other places upon it. Mr. Younge executed the work at Magdeburg, and was rewarded with a gold medal. We are informed that Mr. Younge never had any instruction as an artist—an assertion which we are quite ready to believe, for we doubt not that contact with artistic minds would have conferred upon him an amount of taste which would have rendered these abortions impossible to him. While on this subject, we may remark that this elaborate and difficult file was excelled in elaboration and difficulty by a specimen in the Danish department, in which was a file of circular section, the teeth representing, in a spiral passing several times round the file, the maker's name, the date, wreaths of flowers, &c. After being called upon to admire this file, and having, as you think, sufficiently admired it, heigh presto! the exhibitor pulls out a second file from the interior of the first, as elaborately ornamented as before. You admire, and think there is an end. No such thing; the second file contains a third; the third contains a fourth; the fourth contains a fifth; and so on until you come to a ninth file, which contains a tenth, about the size of a small sewing needle. Weary with admiring, we depart as quickly as we can, deploring that so much ingenuity should have been thus misapplied. Life is not long enough for such things, when we consider how much truth and beauty there is in the world to be studied and mastered, and how much real earnest work a man has in cultivating himself.

The next process in the manufacture of files is the hardening, except for those descriptions which are used on ivory, wood, and other soft substances which admit of being sharpened up with a hand file. Before being hardened the files are immersed in a composition of beer-grounds, yeast, salt, and roasted cow's hoof—the object of which is to protect the teeth of the file from the direct action of the fire and the oxidising and decarbonising influence of the air. One use of the salt is to furnish a rough index of the temperature, since it shows by its fusion that the hardening heat has been attained. When the files have been raised to a red heat they are taken out, straightened by percussion or bending between a couple of iron bars, returned to the fire, and when the salt fuses, taken out and plunged into cold water, many precautions being necessary to prevent or to correct warping. The tang is tempered by being immersed in molten lead, for if it were left as hard as the

file it would be liable to snap off. The files are finished by being scrubbed with sand and water or coke-dust and water, then put into lime-water to remove the salt. They are next dried at a fire,



Fig. 65.—HARDENING.

rubbed over with olive oil containing turpentine, and lastly are tested by being struck against a piece of steel, and the steel is also drawn along the teeth; the vibratory sensations thus produced determine the quality of the file.

So much for files. The two large cases which form such conspicuous objects in the Sheffield Court (see Fig. 3) contain some glittering specimens of Sheffield ware, or plated goods, which bear the same relation to solid silver that a veneered piece of furniture does to solid mahogany. In the manufacture of plated goods an alloy of copper and brass is cast into an ingot about 1½ inch thick, 3 inches broad, and 18 inches long. The face of the ingot is smoothed with a file on one side for single plating, on both sides for double-plating. A plate of silver equal in weight to about 1-24th or 1-30th that of the copper, and for double plating from 1-12th to 1-15th, is attached to the ingot by means of iron wire, and a little borax is brushed in at the edges. The ingot is now put in the plating furnace, and carefully watched until the silver is drawn into contact with the copper; the moment this takes place the ingot is removed, for if left longer the silver would become alloyed with the copper, and the plating be spoiled. The ingot is now cleaned and rolled out into sheets, the silver spreading and perfectly covering the copper in the process. After several annealings between the rollings, pickling in hot dilute sulphuric acid, and scouring with fine sand, the sheets of metal are ready for the formation of innumerable articles by raising with the hammer, by spinning in the lathe, by stamping, chasing, &c.

The plated copper wire used for making toast-racks, bread-baskets, &c., is formed by first converting the silver foil into a long hollow tube, and inserting a red-hot copper rod into it, when the edges of the silver are united by the pressure of a steel burnisher. The copper rod is then removed, the silver tube is cleaned inside, and is next made to fit exactly upon the copper rod which is to be covered. The compound rod is then raised to a red heat, and the two metals are made to unite by means of a steel burnisher. The compound rod is now ready to be drawn into wire of the required form and fineness.

The art of raising works in metal by means of a hammer consists in the skilful application of circles of blows upon a sheet of metal, and this must be of such a size and thickness as to be sufficient exactly for the formation of the article without any excess of metal to be cut off, or deficiency to be supplied, and the blows must be so managed that the finished work shall be of uniform thickness. Thus, a hollow ball 6 inches in diameter is composed of two circular pieces of copper each 7½ inches in diameter; the circumference of the disk measures 22½ inches, and this becomes contracted to 18 inches, or the circumference of the ball, while the original diameter of the disk, 7½ inches, has become extended to 9 inches, or the girth of the hemisphere. The ball at the top of St. Paul's Cathedral was raised in two pieces only. The metal was first thinned and partly formed under a tilt-hammer, next sunk in a concave bed, and raised with hammers not much larger than usual; the two parts were rivetted together in their place, the joint being concealed by the ornamental band. Sugar-pans, stills, &c., often present fine examples of the copper-smith's art.

Circular works in thin metal and comparatively small in size are formed rapidly on a lathe by the process of *spinning* or *burnishing to form*. For example, the body of a Britannia metal tea-pot may thus be spun from a disk of metal. This disk *d d*, Fig. 66, is

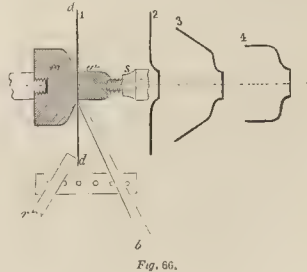


Fig. 66.

held between two flat surfaces of wood *m w*, by means of the fixed centre screw *s* of the lathe; *m* is a mould or chuck of the form of the lower part of the tea-pot. On causing *m*, *d d*, and *w* to revolve, the burnisher *b*, which rests against a pin in the lathe rest, is applied near the centre of the metal disk, while a wooden rod *r* supports the edge on the opposite side. In this way the metal becomes rapidly bent or swaged into the forms 2, 3, 4, successively, and is made to fit close against the curved face of the block *m*. A

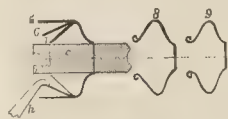


Fig. 67.

cylindrical block *c*, Fig. 67, of the diameter of the intended aperture or mouth of the tea-pot is next made to take the place of the block *m*; by means of a burnisher and a hooked stick *h*, the metal is gradually forced inwards as at 5, 6, 7, and the edge curled, as at 8, for stiffening the mouth of the finished vessel 9. In some cases the mould *m* is made up of a number of pieces, like a boot-tree, so as to be of the exact shape of the vessel to be turned. The operation of spinning is pleasing and expeditious, and reminds one of the manipulation of the potter, as Mr. Holtzapfel remarks in his excellent work on *Mechanical Manipulation*, to which we are indebted for Figs. 66, 67, and a few other illustrations.

The jelly-moulds, and suchlike works, where the raising is considerable, are produced by the hammer; but works in less relief, and which are required in considerable numbers, are formed by means of dies: the raising, however, must be very gradual, or the metal will be cut and rent. Thus, thimbles are raised at five or six blows between as many pairs of conical dies. In some cases stamping and spinning are alternated; in the vertical sections marked A to G, Fig. 69, we have the several forms which are given to the sheet of metal *a a*, Fig. 68, by

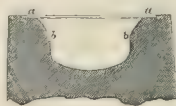


Fig. 68.



Fig. 69.

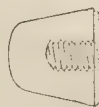


Fig. 70.

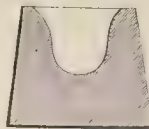


Fig. 71.

it attains the shape of G, the work is burnished on a chuck, Fig. 70, stamped in a second die, Fig. 71, burnished on a second chuck,

Fig. 72, struck in a third die, Fig. 73, and burnished on a third chuck, Fig. 74, during which the metal passes through the forms H I J K L, Fig. 75; the work being annealed from time to time.

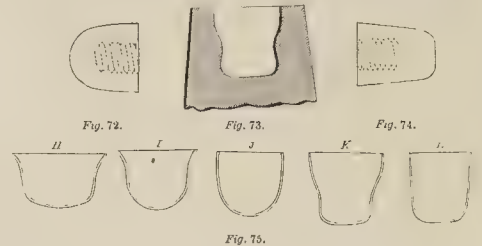


Fig. 75.

Fluted works are raised nearly as cylinders with bottoms to the shape of L, and the flutes are gradually formed by means of two or more pair of dies or forces, Fig. 76. In producing such a form as

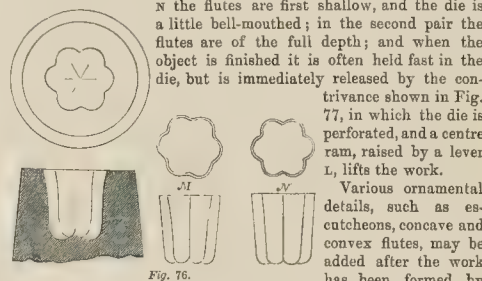


Fig. 76.

one of the above processes. If swage tools cannot be employed,

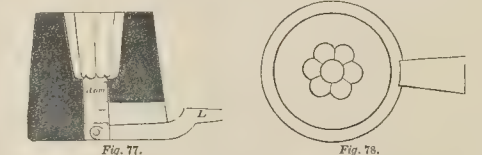


Fig. 77.

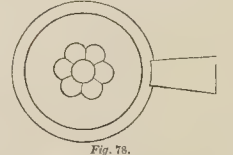


Fig. 78.

the parts may be *snarled-up* by means of a *snarling iron* *s*, Fig. 79; one end of which is attached to a vice *v*, while the other end *e* is turned up so as to reach any part of the interior of a vessel. The work is held firmly in the two hands, with the part intended to be *set-out* exactly over the end *e*, while the iron, being struck with a hammer by an assistant, vibrates rapidly, and throws out the metal in the form of the end of the tool.



Fig. 79.

The snarling-up being complete, the vessel is filled with a composition of pitch and brick-dust, which serves as an internal support, and being put on a sand-bag *s*, Fig. 80, the snarled-up portions may be corrected on the outside by means of appropriate punches or chasing tools *t*.



Fig. 80.

We have now finished our survey of the Sheffield Court. The reader will perceive from the above details that the products of that great manufacturing centre, *Hallamshire*,* are of a varied and interesting kind. There are many subsidiary trades which we have not noticed; the staple productions of the place relating to iron, and steel, and plated goods. These are exhibited in the Crystal Palace in their finished state—no attempt being made to illustrate the progress of manufacture by the exhibition of speci-

* The district in which Sheffield is situated is so called.

mens in various states between the raw product and the finished article; nor are there any of the workmen's tools, models of furnaces, workshop interiors, melting-pots, drawings, and contrivances which throw so much light on manufacture, and constitute the value of a museum. The Sheffield Court is nothing more than a bazaar for the exhibition of Sheffield goods. We must, therefore, hope to find in the "Raw Produce Department," as it is called, that progressive series which would have added so much value to the collections in the Sheffield Court.

In noticing the manufacture of iron we have given some engravings illustrative of the iron-founder's art. There are in the Crystal Palace many beautiful specimens of iron castings, or of copies thereof in plaster; so that it will be neither uninteresting nor inappropriate to conclude this chapter with a few details respecting casting and founding.

The valuable property of fusibility admits of many of the metals being reduced to a fluid state, and being poured into moulds of a previously-determined form, so that on again resuming the solid state they retain the form thus impressed upon them.

In making a casting the first thing generally is to make a pattern in wood of the intended object. The pattern-maker is a very skilful workman, and is constantly required to exercise much thought and judgment. Iron castings contract in cooling nearly 1 per cent of their length, so that it is necessary to make the patterns larger than the intended castings; for which purpose measurements are made by a *contraction-rule*, in which each foot is made $\frac{1}{4}$ th of an inch longer than ordinary standard measure. Castings are usually made in sand, which is supported by shallow iron frames called *flasks*. Thus, in Fig. 82 the bottom 4, 5, rammed full of sand, is resting on a flat board 6; the model of the flat bar shown in the figure is placed on the surface of the sand, and that of the round bar is imbedded half way in it. The mould is then dusted with dry *parting-sand* or powdered brick-dust, to prevent the separate portions of the damp sand in the two halves of the flask from adhering together. The top part of the flask 2, 3, is shown empty in the figure; it is attached to 4, 5, by means of pins, which fit into corresponding holes. Part 2, 3, is rammed full of sand and covered with a top board. The sand receives the impression of the patterns. Part 2, 3, is then lifted off, the patterns are removed, and channels for the escape of air are scooped out from the ends of the cavities left by the patterns to the hollows or pouring holes at the end of the flask. The parts are then replaced and fixed, as shown in Fig. 83. The flask is then placed nearly erect, and the metal is poured in from a crucible or an iron pot lined with loam.

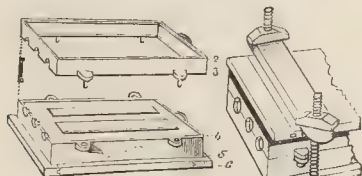


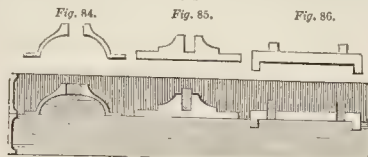
Fig. 82.

Fig. 83.

For large castings, however, the metal is generally poured in horizontally through a hole in the top.

If the objects to be cast contain one or more holes, internal

moulds or *cores* must be used to intercept the metal at those parts. For example, in Figs. 84, 85, 86, the upper figures represent sections of the three casting patterns, and the lower figure the



two halves of the mould; the top half being shaded with vertical lines, the bottom with horizontal, and the cores with oblique lines, while the white open spaces show the hollows which are to be filled up by the fluid metal. When the cavity extends through the model, and exactly represents that which is required in the casting, the work is said to *deliver its own core*; when the hole

extends only partly through, as in Fig. 85, the whole of the pattern is filled with a plug of soft brick; the core is made long enough to project about as much as its own diameter, and the work is moulded as if it were to be cast with a solid pin instead of a hole. The core is then extracted, and put into the hollow which it has made in the sand. Patterns for iron-work are mostly made with *prints* instead of holes, as in Fig. 86—that is, round or square pieces are placed where the holes are required, and the founder is furnished with holes for forming cores of corresponding diameters and sections, and in lengths of from 2 to 12 inches, short pieces of which are cut off as required. In moulding patterns which are undercut *false cores* are used, as in Fig. 87. Many works require core-boxes, as, for instance, in Fig. 88, where *c d* represent the two halves of a core-box used for the casting of a stop-cock; *a* is the core after its removal from the part *c*. In *b*, the model or pattern, the shaded parts represent the projections or *core-prints*, which imprint within the mould the places where the extremities of the mould *a* are supported when placed therein.

In casting busts, animals, foliated ornaments, &c., the moulds are often divided into many parts. For the human figure and for quadrupeds, the four limbs and the trunks require at least three parts each, and often more. The mould is produced piecemeal, and each piece is made to embrace so much of the figure as in no part to require any core

to overhang the line in which it is to be withdrawn. The side of the mould where the figure is partly embedded is dusted



Fig. 87.

with charcoal, and the first core is carefully rammed into the nook, and pared down to the new line of division. The wet

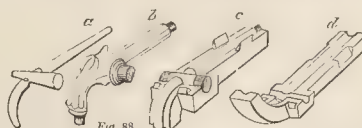


Fig. 88.

sand core is next divided, and the second core is made and dusted, when the moulder proceeds with his third core; the rela-

U U

tive positions of the cores being maintained by notches made at proper places. Wires or broken needles are often thrust through the cores so as to connect them together. The parts of the mould are dried in an oven, so as to get rid of all moisture, otherwise the fluid metal would convert it into steam and destroy the work, or lead to accident. To prevent the metal from adhering to the mould, the face is smoked over a cork fire. If a bust is to be cast hollow from a solid model, the figure is first moulded, and then the core is produced. For this purpose a large space, nearly equal in length and bulk to the bust, is cut away in the sand for fixing the core in the mould, or for the *balance*, as it is called. The entire hollow, both for the bust and balance, is now filled with a composition of plaster of Paris and sand. The mould is next taken to pieces to extract the core, which is thoroughly dried, or *annealed*, as it is called. In this process it shrinks considerably, but, if necessary, it is pared away to leave room for the thickness of the metal. The mould is now faced, dried, and smoked, and the whole is put together for pouring, for which purpose it is inverted and filled from below. Equestrian figures, &c., are sometimes cast in several pieces, which are joined together by solder, screws, or wires.

It is often desirable to get rid of the expense of patterns, as in casting so simple a form as a steam cylinder, for which purpose the process of turning or *loam-moulding* is adopted. The inner part of the loam-mould retains the name of core in small works, and it is called the *novel* in large ones, while the outer part is the *case* or *cope*. Each part is built on an iron loam-plate, as shown in Fig. 89, or some other contrivance for removing it. On this plate

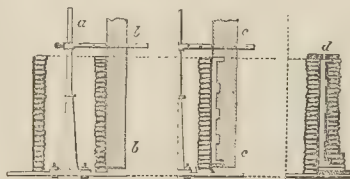


Fig. 89.

Fig. 90.

Fig. 91.

is fixed a vertical axis *a*, which supports a templet *bb*, at the distance of the radius of the cylinder. An inner cylinder of brickwork is then built up, and this is plastered with soft loam, which is scraped into the cylindrical form by moving the radius-board round on its axis. It is now dried, covered with a black wash of charcoal-dust, which serves as a parting; and now the templet *cc*, Fig. 90, cut exactly to the external form of the cylinder, is attached to the axis at the distance of the core required for the thickness of the metal. More loam is thrown on to form that thickness; and this being smoothed, the templet and spindle are dismantled, and the thickness, represented white in the figures, is dried and black-washed. The ring for the outer case or cope is next laid down, its position being denoted by fixed studs or marks, and the brickwork, Fig. 91, is built up and worked accurately to the turned thickness. The new work on the cope being dried, is lifted off by means of a crane and a cross-beam with four chains, Fig. 92, the lower plate having

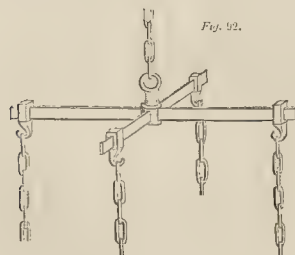


Fig. 92.

four ears by which it may be lifted. The loam which forms the thickness is for the most part dragged off, and the fragments that remain of it are picked out of the cope; the two parts of the mould

are then repaired, black-washed, and dried, and are put together in a pit sunk in the floor of the foundry. The top edges of the mould are covered with a loam-cake, as at *d*, Fig. 91, for the entry of the metal and the escape of the air.

The large cylinders of Cornish pumping-engines, 95 inches in bore, and the blowing cylinders of blast-furnaces, Fig. 14, 105 inches bore, are made without using the thickness; the case or cope being built up in the pit, and turned inside with a radius-bar, while the core is erected on a plate on the floor, and turned outside to a gauge, and when dried is lowered into the other by a crane. The core is strengthened by iron bars, to enable it to resist the pressure of the fluid metal; and the outer cylinder is surrounded by iron rings, piled one on the other, and made tight by ramming in sand, with stays proceeding from the rings to the side of the pit. Large pans and other circular works are moulded with circular templets; the cores of water-pipes are turned upon an iron tube pierced with holes, placed across tressels, and turned round by a winch handle. A shaper-board or scraper is fixed parallel with the axis of the tube; the latter is wound round with hay-bands covered with loam, turned, dried, and black-washed; the thickness is now laid on and black-washed, after which the tube to be cast is moulded in sand. The thickness is removed from the core, and the core is inserted in the mould, and everything made ready for casting.

Loam-moulding is also used for many works in brass. Large bells are turned by means of wooden templets edged with metal, and shaped to the inner and outer contour of the core in thickness. In some ornamental works wax is employed for the thickness, and this is melted out before pouring the metal. Brass guns are also moulded in loam, and in these, as in bells, the inscription and ornaments are either impressed within the cope, or they are moulded in wax and fixed on the clay thickness before making the cope.

In melting the iron for casting, a blast or *cupola-furnace* is used. It is a cast-iron cylinder mounted on a pedestal of brick-work, and is lined with road-drift and other bad heat-conductors. It is open at the top for the escape of flame, &c., and for the admission of the charge of pig-iron, waste or old metal, coke for fuel, and lime for flux—the latter being sometimes in the form of chalk or oyster-shells. The back of the furnace has holes, one above the other, for the blast; and as the fluid metal collects at the bottom of the furnace, the blast-pipe is removed to a higher hole, and the lower one is stopped with sand. In front is an aperture by which the melted metal is drawn off. It is made large enough to allow the fuel, slag, &c., to be rapidly raked out at the end of the operation; but at other times it is closed by a guard-plate, in the centre of which is a tapping-hole, which is closed during the melting with sand. For large castings, a number of these cupolas are worked side by side.

The moulds being properly prepared, and the metal sufficiently fluid, the tapping-hole is opened, and the fluid metal is received



Fig. 93.—POURING.

in ladles, or, for large works, is made to flow along channels which lead directly to the moulds. One man can carry from 50 to 70 lbs. in a hand-ladle. From three to five men can carry from 2 to

4 cwt. in a double hand-ladle or *shank*; while larger quantities, from 3 to 6 tons, are conveyed by means of the crane-ladle, Fig. 93. All the ladles are coated over with loam and black-washed. The hand-ladle has a handle 3 or 4 ft. long, with a *crutch* or cross-piece at the end. The shank has a single handle on one side, and a handle with two branches on the other, to give power in the tilting. The crane-ladle has also long handles with forked branches, and this is generally managed by two men at the ladle, two at the crane, and one to skim the dross from the lip. When the cast-iron is first drawn from the cupola, it scintillates very beautifully, and as the temperature declines the sparks become intermittent, after which the surface appears to be covered with innumerable wire-worms darting about with rapid motions, an effect which is most evident in the softest iron. The casting of a large work, whether in iron, brass, or bronze, is a grand and impressive sight.

When the casting is complete, the means adopted to give strength to the mould to enable it to resist the pressure of the fluid metal must be removed from the inner surface, to allow the solid cylinder to shrink in cooling; and even in small castings of hollow objects it is desirable to break down the cores. When the castings are taken out of the mould, the loose sand is scraped off with iron shovels, wire brushes, &c., and the seams are smoothed

off with chisels and files. The hard sand crust is sometimes removed by pickling in dilute sulphuric acid.

Berlin is celebrated for the fineness of its iron-castings, the excellence of which is said to be due to the quality of the iron and the care bestowed on the moulds, these being formed of a very fine sand mixed with a little clay. The iron is made from a bog-iron ore, and the sand is a kind of tripoli, also containing iron. The manufacture of the black iron trinkets, or Berlin ware, as they are called, originated in the struggle between Prussia and France under Napoleon. The country, impoverished by war, was enabled to continue the struggle by the patriotism of the people—the men becoming soldiers, and the women sacrificing their jewels and trinkets to the common cause. Those who sent these valuable articles to the royal treasury received in return ornaments in cast-iron, which bore the inscription, *Ich gab Gold um Eisen*—"I gave gold for iron." Some idea may be formed of the delicacy of these iron trinkets from the fact that in some cases a pound weight is made up of 10,000 separate castings. The price increases with the fineness; and supposing the price of the iron to be 6s. per cwt., the value of the material is increased 1100 times in the coarser articles, and 9827 times in the finest. The foundry at Berlin is open to visitors.



Fig. 94.—IRON SHIELD—CAST BY M. FALLOISE, OF LIEGE.

THE BIRMINGHAM COURT.

A MUSEUM illustrative of the trade of Birmingham would be of great extent, interest, and importance; and even should this trade be represented by a bazaar (for the Industrial Courts of the Crystal Palace do not claim a higher character), the collection would be varied and interesting. At the time we write, however, the Birmingham Court is but a poor exponent of the trade of that busy town, whose wares are to be met with in almost every portion of the world, as much among the uncivilised as the polished and refined. We think it is Mungo Park who speaks so touchingly of that gush of home-feelings and recollections when, in mid Africa, he saw in the black man's hut some common article with the magic word "Birmingham" impressed upon it. And this is what we desire all our travellers to see—their own unwearied energy reflected by the enterprise of their countrymen; the scientific, assisted by the commercial genius, opening up new portions of the earth; and industry, following on the track, and diffusing comfort and increased intelligence around. For we

most prominent of which may be represented by guns, electro-plated goods, brass-founding, and the innumerable articles made of that useful metal—such as hinges, bolts, bell-cranks, pulleys, castors, stair-rods, desk-rails, ventilators, curtain-poles, rings, &c. Birmingham is also great in buttons, whether of gold, silver, brass-gilt, papier maché, mother-of-pearl, or what is now more common than any of the above, covered buttons. And who has not heard of the steel-pens of Birmingham, produced in such marvellous quantities, and at so cheap a rate—to say nothing of that aristocratic variety of pens made of gold, palladium, gold and silver, and silver-pointed with native alloys of iridium and osmium? It is to Birmingham also that ladies owe the production of those tiny articles, pins; these are made in such profusion that one house alone works up annually upwards of 150 tons weight of metal into pins, sufficient to supply about 100 pins, half an inch long, to each inhabitant of the globe, and which, if placed in a straight line, would extend to a length of 787,500 miles, or upwards of

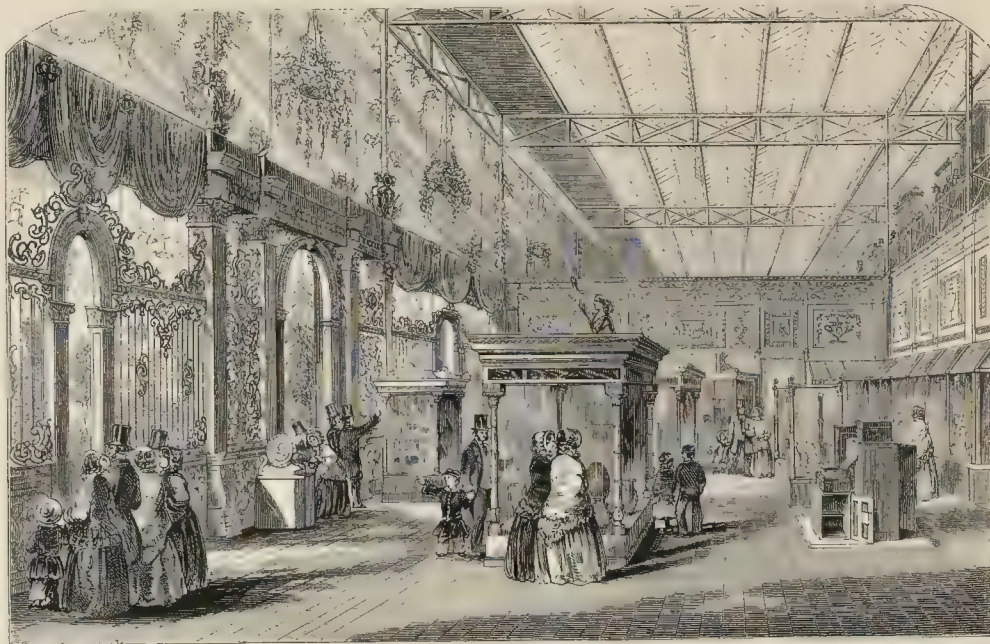


Fig. 95.—INTERIOR OF THE BIRMINGHAM COURT.

may be quite sure that the savage does not use the Sheffield knife, or the Birmingham spoon, without having given something of his own in return—some palm-oil, some elephants' teeth, some gold-dust, or other raw produce: and thus he is stimulated to native industry—the great antagonist of the slave-trade, and, once industrious, he is on the high-road to civilisation. Hence it is that we regard with great interest such collections as the Industrial Courts profess to bring together. They have a higher value than mere amusement; they can do more than excite the wondering stare of the crowd: they can serve not only to illustrate the properties of things, and man's high ingenuity in converting them to his use, but also as links to connect man with his fellow-man in some distant part of the globe, and make the workshop of Birmingham flourishing, because the black man's hut under the African palm-tree also holds a happy, prosperous family.

Birmingham is celebrated for a variety of manufactures, the

thirty times round the earth, or more than three times the distance of the moon from the earth. Some of the villages in the neighbourhood of Birmingham furnish needles, in quantities almost as surprising as those of pins. Some of the Birmingham factories produce nothing but nails; others turn out only screws. The introduction of railways has called into existence many new trades in connection with railway carriages, some of the metal-work for which, such as wheels, axles, &c., is furnished by Birmingham. Here also are produced that large and fanciful variety of lamps and chandeliers, and as a consequence thereof, one or two branches of the glass trade are located here—such as the production of glass drops, by pressing in moulds, and those more massive forms so familiar to our readers in Mr. Osler's celebrated crystal fountain. In connection with glass, we are reminded of Messrs. Chance's extensive glass-house, near Birmingham, which produced the material which gives the Crystal Palace its distinctive name, and the no less extensive alkali-works of the same eminent firm;

while we are reminded of public obligations due to their neighbours, the no less eminent firm of Fox and Henderson. But to return to Birmingham, which is scarcely more than a pleasant walk from the birth-places of the Crystal Palace, we see that the trade is now extended to railway lamps; we have also bronze castings, small bells, stamped works, iron tubes, axes, hatchets, and garden tools, grates and stoves, gas-cooking apparatus, cooking and other utensils covered with a glass enamel, smith's bellows and portable forge, harpoons and spears for the whale-fishery: locks belong rather to the neighbourhood of Wolverhampton, but some are produced in Birmingham. Birmingham is ingenious in metal-work; witness her delicate filagree wares, various descriptions of wire-gauze, &c. This town has also, of late years, attained an eminence in papier maché works, and the art of japanning.*

The Birmingham Court at the Crystal Palace, from the designs of Mr. Tite, illustrates the use of iron in ornamental architecture. The façade of the Court is a restoration of English ornamental iron enclosures of the seventeenth century, closely resembling the Louis Quatorze style of France. Such enclosures were made of wrought and hammered iron: the present work is of cast-iron, the art of casting being scarcely known at the time referred to. The pilasters are of slate enamelled in imitation of marble, surmounted by iron capitals. The interior of the Court is panelled in the style of the same period, and decorated by Mr.

Sang with emblematical paintings and appropriate ornaments in encaustic. The Court contains specimens by Sutton and Ashe of iron and steel, round iron, square and flat bars, angle iron, T-iron, boiler and ship plates, rivet iron, &c. The Birmingham Patent Iron and Brass Tube Company has a display of enamelled pipes, locomotive and marine boiler tubes. The case of W. R. Lloyd shows how widely the tentacula of commerce extend. Specimens of lignum vitæ, Bombay ebony, and pearl shell, king wood, ivory, and South Sea buffalo shell, show to what distant regions Birmingham sends for some of her ornamental wares; while her peculiar province in the working of various metals is at the same time illustrated by such speci-

mens as Chilian copper, Spanish copper, bismuth, Austrian nickel-speiss, German refined nickel, Spanish cobalt ore, South American

nickel ore, Scotch nickel, Chilian antimony, and Jamaica cobalt. Warden and Co. exhibit nuts and screws; Mr. Onions is here again with his bellows, of which he exhibits a gigantic pair, together with galvanised iron-work, nails, &c. Mr. Chubb has a goodly display of locks and safes; for, although he is known to the public as the owner of an attractive shop in St. Paul's Churchyard, it is not so well known that his works are in the neighbourhood of Birmingham. Mr. Bissell has also a display of locks; Cope and Son dazzle with their electro silver works; and W. Parker shows what Birmingham can do for the gratification of the fair sex in the way of silver and gilt bracelets, bindings, massive ornaments, and jewellery, brooches, studs, and pins. Mr. Wilkinson has a beautiful stand of nickel silver, and electro-plated ware; Lloyd and Summerfield display their patent crystal window and other glass, lamp and gas shades, coloured window-glass. There is also a glass fern-case, and a goodly display of artistic bronzes by Mr. Zimmermann, among which we noticed a set of bronze chessmen on a board of black and white marble, the distinction between the men being in the comparatively red tint of one-half, and the whiter tints of the other, showing in the one case an excess of copper, and in the other an excess of tin, in the bronze. The design of the figures remind one somewhat of Flaxman's, although essentially distinct therefrom. They are for ornament only, since every chess-player of any skill in the game prefers a common turned set of box and ebony.

In the centre of the Birmingham Court is a bronze statue of Boadicea, invoking the Britons to avenge the loss of their liberty and the wrongs of her children. Its size is full-length, and we learn from an inscription on the pedestal that it was copied by Messrs. Elkington, Mason, and Co., from the original marble belonging to Sir S. Morton Peto, Bart.: sculptor, John Thomas. If this statue be the result of electrotyping, as we suppose it to be, from its being the work of Messrs. Elkington, the great electrotypists of Birmingham, it must be regarded as a triumph in the art.

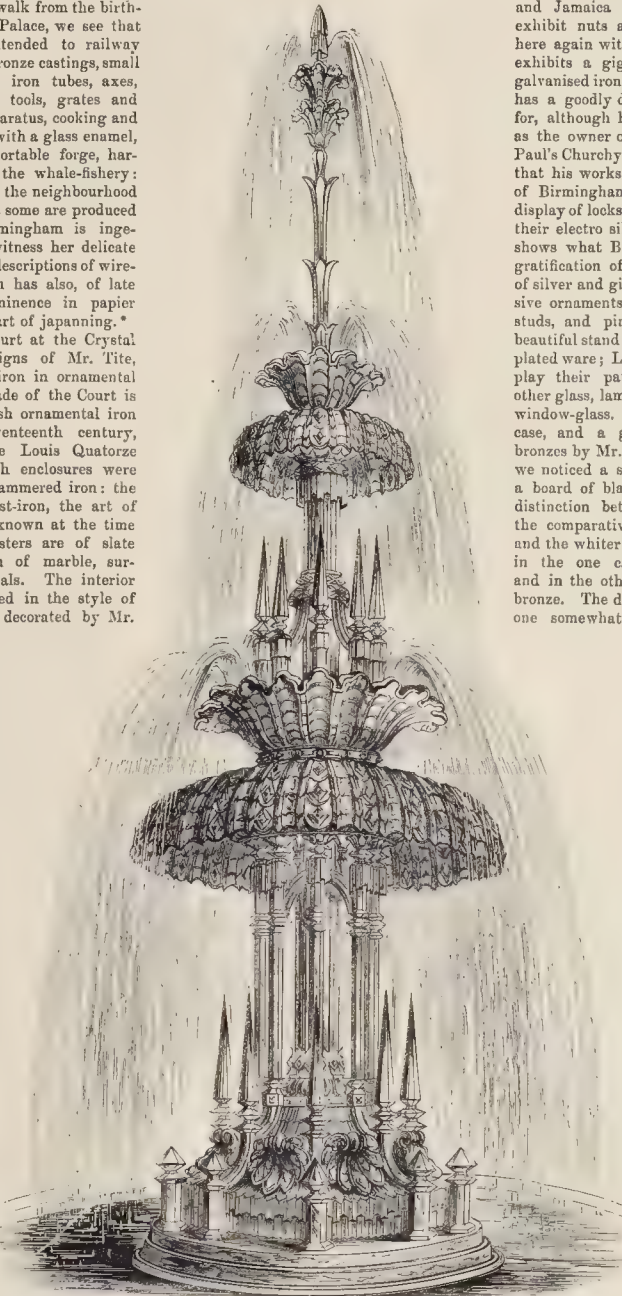


Fig. 96.—CRYSTAL FOUNTAIN, BY MESSRS. OSLER, BIRMINGHAM.

* The general hardware trade of Birmingham may be represented by the classification adopted by the Jury of the Great Exhibition, in their Report on the objects included in Class XXII, which objects, considered with reference to material, range themselves mostly under the heads of:—1. Brass manu-

In the passages behind the Birmingham Court are a number of stalls exhibiting Birmingham wares, although not produced in Birmingham: thus we have brass-castings, sluice-cocks, water-meters, and loose valve-cocks, &c.; iron vases, open-work for palisades, pillars of iron, with Corinthian, Ionic, and Doric capitals, iron tubes, cisterns and tanks for houses and ships, tanks for tallow or cotton waste, or for water, oil, &c., corrugated galvanised iron, galvanised tinned iron tiles and window frames, gas apparatus and bell-pulls, vesta lamps, pumps, garden-engines, and knife-cleaners, wrought-iron vessels, coated inside and out with glass, wire ropes, and bachelors' kettles, defiance locks (a bold term in these days of scientific lock-picking), medals, and hand-bells, and noiseless sausage-making machines, which cut the meat and fill the skin at the same time.

Descending now from generals to particulars, let us first give a few particulars respecting the gun trade of Birmingham. The manufacture of small-arms for war and for the chase is carried on at Birmingham to such an extent that only two European rivals can compete with her. Liege, which is the Birmingham of Belgium, produces a large quantity of small-arms, and furnishes other nations, especially Russia, therewith. France is said to be more advanced than any other nation in this manufacture. St. Etienne is the town chiefly employed in the manufacture of muskets; but the best arms are produced at Paris, where "are combined all the perfection that could be desired for precision of firing with beauty of ornament; the ornaments are very often designed by the best artists, and are executed with remarkable delicacy."* The introduction of machinery for the production of small-arms by Colonel Colt, of the United States of America, and the adoption of that or of similar machinery by the British government, will doubtless have considerable effect on the future destiny of the small-arms manufacture.

The common hand-gun has undergone several changes according to the method of discharging it. It was first fired by the application by hand of a lighted match to the touch-hole. This was improved by the invention of the *match-lock*—a contrivance suggested by the trigger of the cross-bow, for conveying with certainty and rapidity the burning match to the pan; such was the *arquebus* or *harguebus*. The *match-lock* was superseded by the *wheel-lock*, a small apparatus for exciting sparks of fire by the friction of a furrowed wheel of steel against a piece of native sulphuret of iron, hence called *pyrites*, or *fire-stone*. In the reign of Elizabeth the *flint-lock* was introduced, and this continued in use until the invention of the modern *percussion-lock*. Much difficulty, however, was experienced in the application of this lock on account of the difficulty of selecting a proper fulminating powder for the *percussion-cap*, the combustion of ordinary fulminating mercury being so rapid as to

scatter the gunpowder without igniting it. It was found, however, that by lowering the fulminating mercury with *pulverine*, or meal-gunpowder, the desired effect was produced. At the present time percussion-caps for muskets are filled with a mixture of equal parts of fulminating mercury and chlorate of potash fixed by a varnish.*

The new method of firing a gun led to a new form of breeching. The old form consisted of a solid lump of iron, screwed into the barrel close to one end, and the touch-hole was drilled through the side of the barrel above it. With such a form, however, the gun fired but slowly, and a portion of the gunpowder was blown out without being ignited. In 1787, an improved form of breeching was introduced by Nock (Fig. 97), which caused the powder to be ignited in the centre, and much improved the strength and regularity of shooting. On the introduction of the percussion-cap, this form of breeching was improved by Mr. Wilkinson, Fig. 98. The locks of guns

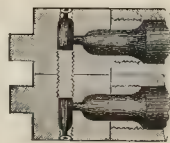


Fig. 97.

have also passed through a variety of changes; indeed, there is no part of the gun that has not been subject to repeated improvements; and these parts are sufficiently numerous, as will be seen from an enumeration of the trades concerned in the production of a best-finished gun. They are:—1. the barrel-forging; 2. the lock and furniture forging; 3. the barrel borer and filer; 4. the lock filer; 5. the furniture filer; 6. the ribber and breecher; 7. the stocker; 8. the screwer-together; 9. the detonator; 10. the maker-off; 11. the stripper and finisher; 12. the lock finisher; 13. the polisher and hardener; 14. the engraver; 15. the browner; 16. the stock polisher.



Fig. 98.

A musket or common barrel was formerly forged out of a skelp of iron about 3 ft. long and 4 inches wide, thicker and broader at one end than at the other; and being hammered to the proper dimensions, it was folded into a cylindrical form until the edges overlapped, and these were then welded together. In consequence, however, of strikes among workmen this method was superseded by the introduction of machinery, in which a bar of iron about one foot long, being turned into the form of a cylinder with overlapping edges, was raised to a welding-heat, and a triblet or cylinder of iron being placed in it, it was passed quickly through a pair of rollers, which completed the welding, and it was elongated to the proper length by a similar rolling at a lower temperature. The method of making barrels for fowling-pieces by twisting has already been noticed with reference to the Sheffield Court.

Supposing the forging to be complete, the barrel requires to be bored true, for which purpose a long square bit attached to a rod is made to revolve rapidly, while the barrel is pressed forwards by means of a crooked lever, held at one end by the workman, while he passes the other along a series of pegs driven into the top edge of the trough or bench on which the barrel is placed, by which means the barrel is forced up against the boring-bit, which is kept cool by water flowing over the barrel. The outside of the barrel is ground on broad grindstones. After smoothing the barrel and filing the muzzle, the work for common guns is finished. The best barrels, however, are first set straight, then attached to a carriage which is drawn gradually forwards along a level surface against the boring-bit, which is fixed in the axis of a revolving fly-wheel. In this way the barrel is bored completely through, the outside is turned in a lathe, and being made correct in every part, it is *tapped* or screwed at the breech end, and the plug is fitted. It is next proved, according to a scale fixed by law, with a charge of powder proportioned to the weight of a leaden ball that fits the bore. The gun-makers of Birmingham are incorporated into a company, with wardens and a proof-master, who are authorised to stamp on the guns proved by them the royal arms, with the letters B. P. V., i.e. Birmingham Proof Viewed. The barrels of guns intended for the public service are proved at a separate establishment, maintained by the government. In the latter case the barrels are proved separately, but in the former as many as 129 may be fired at once by means of a train. They are arranged in frames in a low shed, which

* Caps used for firing cannon are charged with two parts chlorate of potash, two of native sulphuret of antimony, and one of powdered glass. Caps made of fulminating mercury and collodion bronzed over are being tried.

factory, 2. Copper, tin, zinc, pewter, and general braziers; 3. Iron-work; 4. Steel manufactures.

Under the head of brass manufactures may be included:—Cabinet and general brass foundry: consisting of hinges, fastenings, escutcheons, bell-pulls, brass foundry used in ships, knockers, door-springs, castors, &c. Plumber's brass foundry: cocks, valves, pumps, water-closets, &c. Stamped brass: cornices, curtain-bands, finger-plates, &c. Gas fittings, brackets, chandeliers, pillars, gas-burners and consumer's metal, &c. Tubing, plain and ornamental. Metallic bedsteads. Chandeliers, lamps, and candelabra, for oil, candles, or camphine, and lamp-chains. Railway and carriage brass foundry, and signal lamps, &c., and lanterns. Bronze figures, busts, and chimney ornaments. Bells: house, church, ship, table, &c., and alarms. Candlesticks: table and bedroom. Monumental brasses, and ecclesiastical brass-work. Copper-plates for engravers. Miscellaneous: including pins, nails, wire-gauze, birdcages, hooks and eyes, wire-baskets, and ropes.

Works in copper, &c., include:—Kettles, coal-skuttles, coppers, saucepans, steamers, plate-warmers, &c. Bronzed tea and coffee-urns, kettles, &c. Tubing: copper, tin, lead, &c. Pewter, German silver, and Britannia metal teapots, basins, dishes, spoons, ladles, inkstands, &c. Coffin furniture, plates, escutcheons, &c. Zinc articles generally.

In iron there are:—Stoves, grates, fenders, and fire-irons; kitchen ranges, cooking apparatus, smoke-jacks. Warming apparatus for halls and parlours, ships, &c., either by water, coal, coke, wood, charcoal or gas. Shower, vapour, air, and warm-water baths. Ventilators: metallic and otherwise. Pipes and gutters, &c. Locks and hinges. General ironmongery. Ice machines. Knife-cleaning machines. Letter-copying machines and presses. Sadler's ironmongery. Hollow-ware, cast and wrought, tinned and enamelled. Spades, shovels, pickaxes, hoes, rakes, garden-rollers, &c. Nails: cut, cast, and wrought. Screws and railway bolts, &c. Iron safes, cash-boxes, fire-proof, and others. Horsehoes. Gates, railings, hurdles, and stable-fittings. Mangles, washing-machines, &c. Iron bedsteads, garden-seats, &c. Castings in iron.

In steel we find:—Tools and heavy steel toys. Hammers, vices, &c. Steel ornaments, light fancy steel toys, brooches, buckles, &c. Steel pens, and metallic pens of other kinds. Needles, fish-hooks, and fishing-tackle.

In addition to the above list, there are a number of articles of mixed materials, such as buttons, metallic, Florentine, pearl, bone, &c., and other productions coming under the usual denomination of hardware.

* Jury Report of the Exhibition of 1851.

is lined with sheet-iron, containing iron frames for the reception of the barrels; the bullets being received against a dead wall in a mass of sand. Fig. 99 shows the appearance of some gun-barrels burst in proving.

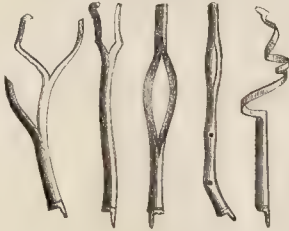


Fig. 99.—GUN-BARRELS BURST IN PROVING.

The barrel is next false-breeched, ribbed, stocked, and screwed together. It is then bored for shooting, and smoothed outside. Double barrels have a flat struck along the inner side of each before laying them together; the breech end for about four inches is brazed or hard-soldered, and the remainder of the length is soft-soldered, and the upper and under ribs are soldered on. The lock and the barrel being jointed to each other if required, the stocker lets them into the wood. The screw-together lets in all the furniture, and puts in all the screws. The gun is detonated by another man, who fits the cock, and finishes the external part of the breeching. After smoothing and boring for shooting, the wood-work is smoothed and finished, making off and chequering, as it is called. The work then passes to a man called the *skipper* and *finisher*, who takes the whole to pieces, and corrects trifling defects. The barrel, being engraved, goes in to brown, which operation consists in producing successive coatings of rust on the surface, and brushing them off as they arise with a steel wire *scratch-brush*, until the required colour is attained. The rust is raised by a mixture of nitric ether, alcohol, sulphate of copper, muriated tincture of iron, and tincture of gum benzoïn. During the browning, which takes about a week, the lock and furniture are polished, engraved, blued, and hardened, and the stock is oiled and polished. The hardening is performed by burying the parts in animal charcoal, keeping them at a red heat for an hour or so, and then quench-

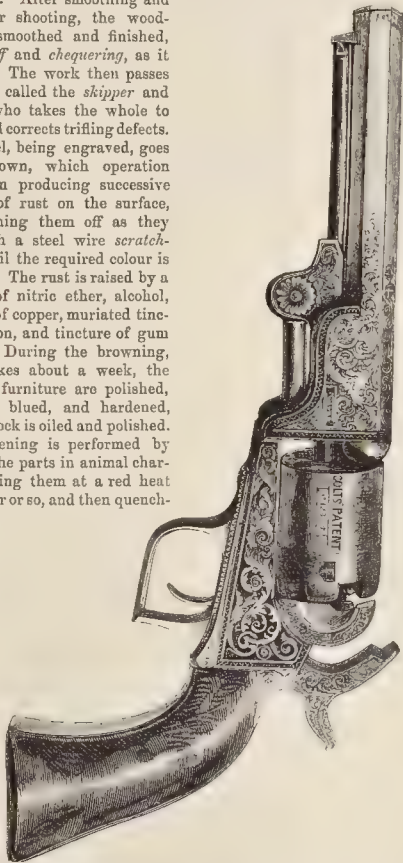


Fig. 100.—COLT'S REVOLVER.

ing in water. The whole of the parts now return to the finisher, who completes the gun.

Walnut is the toughest and best wood for the stocks of guns, but maple and ash are also used for sporting guns. The stocks are coloured with linseed oil and alkanet root, and the best guns are

polished and varnished with shell-lac in spirits of wine. Machinery for stocking guns has been adopted with considerable success.

The preceding figure (Fig. 100), which represents one of Colonel



Fig. 101.—ORNAMENTAL GUN-STOCK.

Colt's revolving pistols, will serve to illustrate the kind of ornamental work not unusual on fire-arms. Occasionally we meet with such elaborate specimens of ornamentation as Fig. 101, which represents a fowling-piece designed by M. Reister, and manufactured by M. Claudin, of Paris. The stock is most elaborately carved; in the

but-end are introduced dogs, a wolf, serpents, mingled with oak leaves, a sort of running pattern of similar devices being ingeniously carried along the whole length of the stock.

There is a great deal of iron and steel-work executed at Birmingham, some of which we will briefly notice, before proceeding to works in other metals. In the case of steel pens, the steel used for the purpose is rolled into thin sheets at Sheffield. These sheets are cut into slips 3 ft. long by 4 inches broad; they are annealed and cleaned in dilute sulphuric acid, when the metal is reduced to the required thickness by rolling. Blanks or flats are cut from these strips by means of a fly-press, noticed at p. 160, care being taken that the fibres of the steel run in the direction of the length of the pen. By means of another bed and punch the hole which terminates the slit is pierced, and any superfluous metal which is likely to injure the elasticity of the pen is removed. The blanks being annealed, the maker's name, &c., is stamped on each. The blanks, which are still flat pieces of steel, are next passed through a press, which makes each piece concave for nibbed pens, and forms the barrel for barrel pens. Pens are hardened by being enclosed in an iron box raised to a red heat, and quenched in oil. The adhering oil being removed by agitation in a tin plate barrel, they are tempered and put into a revolving cylinder with sand, which makes them quite bright. The nib is ground on a small emery wheel, and it is not till these varied operations have been completed that the slit is formed; this is done with a chisel or wedge with a flat side fixed to the bed of a press, while the descending screw has a corresponding chisel. The pens are next coloured brown or blue by placing them in a revolving metal cylinder over a charcoal stove until the film of oxide of the desired colour is formed. The pens are lastly immersed in a solution of lac in naphtha, which imparts brilliancy; they are then dried off by heat, counted, and made up into boxes. It is stated that Mr. Gillott, of Birmingham, employs upwards of 500 persons in this manufacture, of which number four-fifths are females; skilled workmen being employed to repair and set the tools. The annual production of this house is said to exceed 150,000,000 pens.

While on the subject of pens, we may mention that these useful articles have been made of horn, tortoise, and other shells, and even of glass. Nibs have also been formed of precious stones, such as small pieces of diamond, ruby, &c., embedded by pressure into horn and tortoise-shell nibs, softened by heat. Thin pieces of gold or other metal have also been attached to tortoise-shell, and in Mr. Doughty's pens the nibs consisted of rubies set in fine gold; such pens were very durable, and produced a writing of uniform character; to prevent injury to the points, the inkstand was lined with indian-rubber. Dr. Wollaston formed pens with two flat slips of gold placed angularly side by side, and tipped with rhodium. Messrs. Wiley, of Birmingham, formed pens of the indestructible metals already referred to.

Equal in importance with the above manufacture is that of needles, which is carried on in certain villages not far from Birmingham, such as Redditch, Feckenham, Beoley, Studley, Coughton, Alcester, Astwood Bank, Crabb's Cross, &c., all of which lie near together. As in the case of pens, Sheffield supplies the raw material, which consists of soft, clean steel wire, in coils of various sizes and weights. The ends of a number of wires of equal size being collected together, lengths, each equal to the production of two needles, are cut off by means of shears. In this way a number of pieces are collected sufficient for making from 30,000 to 60,000 needles. The pieces as cut from the coils all partake of the curve of the coil, and are straightened by several thousand of them being placed within a couple of broad rings, heated to redness, and rubbed backwards and forwards by means of a smooth file, as shown in Fig. 102. The friction of the wires against each other and against the file quickly straightens them. The wires are next pointed at the ends upon small grit stones, the workman dextrously pointing a number of ends at once, holding them in his left hand, and rotating them by means of his right, so as to form a perfect cone or point. The contact of the wires with the stone produces a stream of sparks, and a quantity of metallic and stone-dust, which would be as fatal to the workman as the dust produced in the grinding of cutlery once was, as already noticed, were it not that the same system of ventilation is now generally adopted by the needle-grinders, as at Sheffield. The wire pointed at each end, sufficient, as we have said, for two needles, is stamped in the centre for the eyes. The lower die is supported on a block of stone, and

the upper die is contained in a hammer of about 12 lbs. weight, which can be raised by pressing a lever with the foot. The workman, with a number of blanks in his hand, drops them one at a time upon the iron bed, pushes it up against a piece of metal which

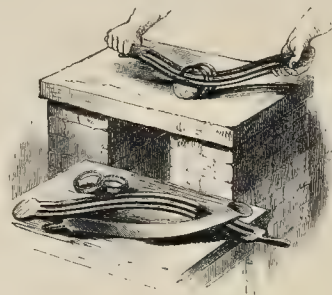


Fig. 102.

acts as a gauge, raises the hammer with his foot, and lets it fall with a smart blow. The two raised faces of the die produce two opposite indentations on the wire, bulging out a portion of its substance. The hole for the eye is not pierced through at this operation, or there would be danger of tearing the metal; the groove is formed, and an indentation for the eye, the latter being now pierced by means of a couple of steel points or cutters, which

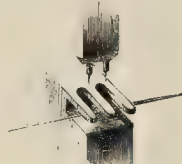


Fig. 103.

are brought down upon the blanks, as shown in Fig. 103. This eyeing, as it is called, is performed by a boy, who has a number of wires in his hand, spread out like a fan, and placing them one at a time in a notch in the iron bed of the press, brings down the points by means of a lever, thus punching out the eyes, then raising the points the wire is slipped off from them by means of three projecting pieces of metal, shown in the figure. The next operation is to remove the bur produced on each side of the eye in the process of stamping, shown at Nos. 2 and 3 of Fig. 104. This is



Fig. 104.

done by threading a number of the wires upon thin wires run through each line of eyes, as shown in Fig. 105. The bars are then easily removed by means of a flat file, after which the needles are separated by bending them backwards and forwards between the two spits, thus producing two separate rows of needles, each row spitted on a wire. The points of each row are next grasped in a sort of hand vice, Fig. 106, and the heads being placed on a small anvil, are filed into shape. The needles are now said to be headed, or made; and the processes hitherto noticed form what is called *soft-work*, or soft processes, from the wire being in a soft state. The finishing processes form what is called *bright-work*, preparatory to which the needles

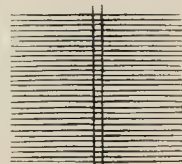


Fig. 105.

are straightened by a woman called the *soft-straightener*, who rolls them on a flat steel plate with the convex face of a curved smooth file. They are next hardened by being raised to a red heat, and suddenly cooled in cold water or oil. This renders them too hard and brittle for use; they are therefore *tempered* by being heated on a hot iron plate, with constant stirring, for about five minutes, until a blue film forms upon them, when they are instantly removed. The needles are now examined separately, and straight-

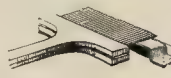


Fig. 106.

ened by tapping each needle with a small hammer on an anvil; this is called *hard or hammer straightening*. Next comes the *scouring* or cleaning, for which purpose the needles are made up in bundles of 40,000 or 50,000 in a piece of stout canvas, showed open and rolled up in Fig. 107. In rolling up the canvas, emery, oil, and soft soap are sprinkled on the needles. A couple of such rows are placed under a scouring-machine, Fig. 108, consisting of weighted slabs or rubbers, which roll the bundles backwards and



Fig. 107.

forwards for 50 or 60 hours, an amount of friction which imparts that smooth bright surface, so necessary to the slender little implement to enable it to pierce the various materials on which it may be employed. After about eight hours' rubbing, the rolls are unpacked, the needles

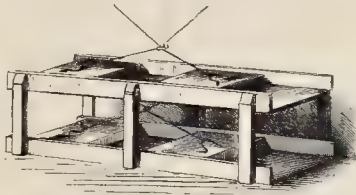


Fig. 108

washed in soap and water, and the rolls are made up again with putty-powder and oil, and the friction is continued for another eight hours, and so on until the polishing is complete. The needles are next removed to the *bright-shop*, placed in long tin trays, and made to lie parallel by shaking. They are next piled in heaps, the heads and points lying one way or the other. The points are arranged all one way by a little girl, who wraps a piece of rag round her forefinger, and pressing this against the side of the heap, while the left hand is pressed against the opposite side, the points of the needles enter the rag, and she lifts them up and turns them over or drags them out, so as to form a separate pile. In this way the points are quickly placed in the same direction. The needles are examined, and broken and defective ones removed, after which comes the delicate operation of drilling, to remove the jagged and rough portions, and produce that smooth appearance, like the bow of the handle of a pair of scissors. For this purpose the eyes must first be softened, which is done by placing the needles on a steel slab with the eyes projecting over, and bringing a red-hot plate near them until a dark blue tint is produced, which shows the proper temper for working.



Fig. 109 —DRILLING THE EYES.

The drills are minute three-sided wires attached to a wheel revolving with great speed; the driller, seated at the bench opposite a window, as shown in Fig. 109, and taking a number of needles in the left hand by the points, spreads them out like a fan, and brings each eye in succession up to the point of the drill, then by a twist of the finger and thumb turns round the needle, and presents the other side of the eye to the drill. Keen sight and steady hands are required for this kind of work. After this the points are finished, first on a small stone, and

then on wheels of wood covered with buff leather, and coated with polishing paste. The needles are now counted into twenty-fives, folded up in blue papers, and labelled. Twenty of these form a packet.

Nails, which are now produced in enormous quantities in Birmingham by means of machinery, formerly gave employment to many hands in forging. Hutton, the historian of Birmingham, in

approaching the town from Walsall, in 1741, was "surprised at the prodigious number of blacksmiths' shops on the road, and could not conceive how a country, though populous, could support so many people of the same occupation." In some of the shops he observed females wielding the hammer, and on inquiring "whether the ladies in this country shod horses," he was answered with a smile, "They are nailers."

The nailer's apparatus is very simple: it consists of a small hearth or forge for heating the iron rods out of which the nails are wrought, an anvil, a hammer, and a few swage tools adapted to the various forms of nails—and those are somewhat numerous, amounting to more than 300, with at least ten different sizes for each sort. A good fibrous iron is required for nails, and when they were forged by hand, each man usually accustomed himself to the forging of one or two sorts only. Nails are known by various names, such as *fourpenny*, *sixpenny*, *tenpenny*, &c., which are retail terms; or better still by their uses, such as *hurdle*, *pail*, *deck*, *scupper*, *mop*, &c. Other sorts, of more general application, are named from the form of the heads or the points, such as *rose*, *clasp*, *diamond* heads, and *flat*, *sharp*, *spear* points. The thickness is expressed by the terms *fine*, *bastard*, *strong*. The length is sometimes expressed in linear measure; but it is usually included in the weight of a thousand nails; thus *7 lb.-rose* means a nail with a rose head and a sharp point about $1\frac{1}{2}$ inch long, a thousand of which weigh about 7 lbs. A few varieties of nails are represented in Fig. 110. No. 1 is called *rose-sharp*, and is used in coopering,

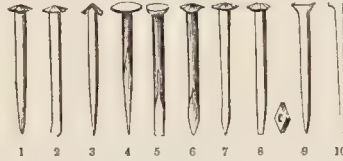


Fig. 110.—VARIETIES OF NAILS.

fencing, and other coarse purposes with hard wood; a thinner sort, *fine-rose*, is used with soft woods, and has a broad, spreading head, well adapted for holding the work down. No. 2, the *rose* with *flat* or *chisel* points, is used with wood that is likely to split; the flat points are driven with their edges across the grain. No. 3, *clasp* nails, with heads projecting downwards, stick into the wood and clasp it, and when driven below the surface, allow a plane to pass over them. No. 4, *clout* nails, are used for nailing iron-work, &c., to wood. No. 5, *counterclout*, have countersinks under the head, and chisel-points. No. 6, *fine-dog*, and a thicker nail called *strong* or *weighty-dog*, used for nailing down stout iron-work, and for purposes where the heads are not required to lie flush with the work. No. 7, *Kent-hurdle*. No. 8, *rose-clench*, used in ship and boat-building; they have no points, the ends being left square, so that



Fig. 111.

they punch out their own holes, driving a portion of the wood before them. They are also used for packing-cases and boxes. The term *clench* is derived from the method of securing the extremity by hammering it down, or by placing a small diamond of metal over it, called a *rove*, and rivetting the end of the clench upon it. No. 9, *horse-shoe* nails. No. 10, *brads*. We may also refer to *tacks* as a numerous and useful class of nails.

Nails are formed by casting as well as forging. They are brittle, but very cheap, and are hence used for such coarse purposes as the lathing of plasterers, for garden-walls, for stout boots and shoes, &c. As already stated, nails are extensively manufactured by cutting or punching. It is evident that if we take a narrow strip of paper, Fig. 111, and cut from the end of it triangular sections in the form of wedges, turning the paper over after every cut, so that the head or broad part of every clipping may be taken from the point of the preceding one, and *vice-versâ*, we have the principle of nail-making by machinery. In this way we easily get the shoe-nail called *sparable* or *sparrow-bill* A, or the smaller

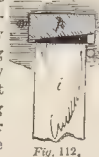
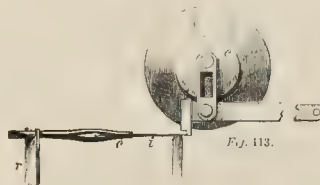


Fig. 112.

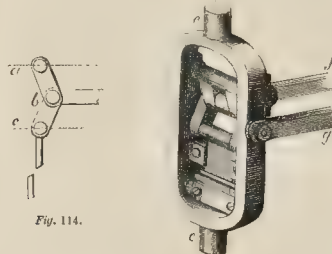
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wedges *B*, called *sprigs*. If shears were used on the strip of iron, the nails would be bent, or curled, an effect which may be avoided by a fly-press with cutting punches. Suppose *m*, Fig. 112, to be a rectangular mortise in the bed of a fly-press used for cutting brads, such as *C*, Fig. 111, the punch *p* fills the bed, but a portion, represented black in the figure, is nicked in, or filed back to the size and angle of the brad. A pin or stop *s* guides the strip of metal into the mortise, and to prevent it from passing too far over the hole in the bed, the punch is not raised quite out of its bed, thus the metal is stopped by the tail of the punch, while its outer or rectangular edge removes the brad. The strip is turned over by an attendant after each descent of the punch, so that the head of one brad is cut from the point of the one previously made. In cutting brads with heads, and headed nails, as at *D*, *E*, Fig. 111, the same principle is observed; *m m* show the rectangular opening in the bed of the press; *p* is the tail of the punch fitting into it; *s* the stop, placed at such a distance from the opening in the bed as to correspond with the vertical height of the head, so that the strip of metal may overhang the aperture by that quantity: the width of the point of the brad is also equal to the projection of the head. When the strip of iron is first applied, a wedge-shaped piece is cut off, equal to the difference between the tail of the punch and the bed; there is a small projection left in the strip near *s*. On turning over the slip this projection rests against the tail of the punch, as shown at *s*, so that the next cut removes a perfect brad, and leaves the head of another ready formed.

In cutting nails by steam power the cutter is attached to the end of a long arm, to which a rapid up and down motion is given by means of a crank or an eccentric, as at *e*, Fig. 113. The strip of



metal *i* is held in a clamp *c* supported in a rest *r*, which enables the boy who attends the machine to turn the metal over while the cutter is ascending; or to prevent the necessity for turning over the strip, a toggle or knee-joint may be used. In this joint the two parts *a b*, *b c*, Fig. 114, are jointed together at *b*, and the end *a*

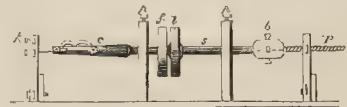


being jointed to the upper part of the press, and *c* to the top of the follower, when the parts *a b* and *b c* make but a small angle, the ends *a* and *c* come closer together, and the follower is raised; but when the two levers are straightened, *a* and *c* separate with a small motion, but with great power. The toggle-joint is bent and straightened by the revolution of a small crank united to the point *b* by a connecting rod *b, f*. The whole press moves upon pivots *e e* by the rod *g*, so as to be alternately inclined to the right and left to suit the angle of such nails as are wedge-shaped or have no heads. In some cases, when the nail is cut off, it is grasped between forceps or dies, and a hammer, set in motion by the machine, strikes a blow which forms the head. After the cutting or punching of nails, they are annealed in close iron boxes, heated in ovens, and left to cool slowly.

Vast quantities of nails are manufactured in Great Britain, the larger proportion of which are consumed at home, although there

is a considerable trade to the colonies and the East. The Continent of Europe is supplied with nails chiefly from Holland and Belgium; indeed, the price of nail-rods is lower in Belgium than in England. In the passage behind the Birmingham Court of the Crystal Palace is a large display of nails from Liege. These nails are all galvanised, or covered with zinc, for protection from rust—a plan now common for sheet-iron and other articles in that metal. One method of covering iron with zinc is to cleanse the iron in a bath of warm sulphuric or hydrochloric acid and water, then to hammer and scrub the metal, so as to produce a chemically clean surface, after which it is immersed in a preparing bath, consisting of a saturated solution of hydro-chlorate of zinc and sulphate of ammonia, and lastly, it is transferred to a metallic bath composed of 202 parts of mercury and 1292 parts of zinc, both by weight; to every ton weight of this alloy is added one pound of potassium or of sodium. As soon as the cleaned iron has obtained the point of fusion of this triple alloy, namely 680°, it is removed thoroughly coated with zinc. Such is the affinity of this alloy for iron, that at 680° it will dissolve a plate of wrought-iron one-eighth of an inch thick in a few seconds. Wire, nails, small chains, are galvanised in a similar manner.

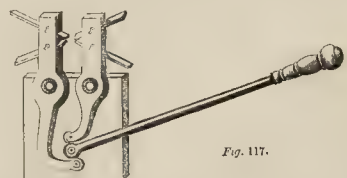
Birmingham is also the birth-place of screws—especially of that variety used for fastening pieces of wood, or wood and metal together, whence they are called *wood-screws*, or *screw-nails*. The blanks for such screws were formerly forged by the nail-makers. The next improvement was to form them out of round rolled iron, cut to the required lengths, and the heads were formed by pinching them while redhot between a pair of dies, after which the threads were cut by means of a file. Screws are now cut by machinery, for which purpose a coil of screw-wire is arranged so as to be drawn into the machine as it is wanted; the required lengths are cut off, one end of each is struck up to form the head, and the blanks thus produced are turned out into a box. The blanks are next taken by hand, and placed one at a time in a lathe, where the heads and necks are turned, and cut into shape. The notch or nick in the head is cut by means of a circular saw, and lastly the *worming* or cutting of the thread is performed in a lathe in the following manner:—A steel spindle or mandril revolves between collars in two uprights by the motion of a strap passing round the pulley *f*, Fig. 115; *l* is a loose pulley for carrying the strap when the



machine is stopped; *b* is an iron box, containing the pattern or regulating screw *p*; this is 5 or 6 inches in length, and is a pattern of the thread of the screw to be cut, the latter being fixed in an iron *chuck* or holder *c*, shown separately in Fig. 116, and is held firmly



by a kind of hasp, the nick of the screw resting against a chisel-spike, and the shank projecting. At *k*, Fig. 115, are the cutters, shown on a larger scale at Fig. 117. The frames move on joint-



pins, and, by the action of the lever, the cutters act upon the shank of the screw, and exert more or less pressure as required. There is

also a lever which causes certain directing points, resembling the cutters, to close upon the regulating screw F, and the two levers being connected by a horizontal bar, can be depressed or raised together, and the cutters and directors applied at the same moment; thus the inclination of the thread is determined by the pattern-screw, and its shape by the form and position of the cutters. This machinery is commonly managed by a woman, who fixes the blank in the chuck, and makes it revolve by shifting the strap from the loose to the fixed pulley. She then depresses the levers and the guides which act on the regulator screw, and cause the chuck to move forward, and force the shank of the blank screw between the cutters, which turn out a shaving of metal, and leave a sharp thread or worm. During this operation a little water is applied to the steel cutters to modify the heat occasioned by the friction.

Screws are also cut by dies instead of cutters. The dies are arranged on a frame, and are opened and shut by a right and left-handed screw. Ryland's *gimlet-pointed screws* are made in this way. Such screws enter the wood easily, and retain their hold firmly. In Nettlefold's screws the upper side of the thread is made flat or inclined, which greatly increases the resistance to its being forcibly drawn out of the wood; while the under side, being also much inclined, enables the screw to penetrate the wood with greater ease. Fig. 118 represents such a form of screw; Fig. 119 the

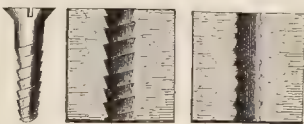


Fig. 118.

Fig. 119.

Fig. 120.

mould made by it in wood; and Fig. 120 a section of the common form of screw, in which the worm is shallow and imperfect.

Screw bolts, and other screws for working in metal, are cut by a die resembling a common iron nut, formed of well-tempered steel in two parts. These are fixed in an iron box or *die-stock* with two long handles or levers, and there is also a set screw, by means of which the two halves of the die may be brought nearer together, or removed farther from each other. The blank or iron pin on which the screw is to be cut is turned to the proper size, and introduced by its narrow end into the dies, which are then closed, so as to grip the pin, which being set in a vice, the die is worked round upon it by means of the two handles, the two halves of the die being occasionally set closer together as the work proceeds.

Small metal screws are cut by a steel *tap-plate*, or *screw-plate* (Fig. 121), wormed and notched, and furnished with several holes, slightly diminishing in size, from two to six holes being used for each thread. For large wooden screws, a screw-box with a steel-cutter, c, Fig. 122, is used, consisting of two pieces of wood attached by steady pins and screws, shown in the plan Fig. 123. Interior screws are cut by means of a steel tap, consisting commonly of a screw with a large portion of the worm filed off, the angles left by the operation forming a series of obtuse cutters. Such a tap is shown in three views, in Fig. 124. Large highly-finished metal screws are also cut in the screw-cutting engine.

Birmingham is distinguished for brass—a useful alloy of copper

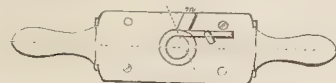


Fig. 123.

and zinc; the quality of the metal depending on the relative proportions of the two metals. In the brass foundry it is usual to take

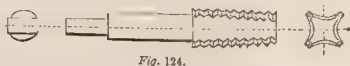


Fig. 124.

1 lb. of copper as the standard, and to designate the kind of brass only by reference to the zinc; so that in speaking of 6 to 8 oz. of

brass, it is understood that that quantity of zinc is alloyed with 1 lb. of copper. The smallest proportion of zinc is from $\frac{1}{2}$ to $\frac{1}{4}$ oz., this enables the copper to cast soundly, which it does not usually do when unalloyed; 1 to $1\frac{1}{2}$ oz. forms gilding metal for common jewellery; 3 oz. forms red sheet brass; 3 to 4 oz. Bath metal, Pinchbeck, Mannheim gold, similar, &c., all resembling inferior jeweller's gold much alloyed with copper. But some of these alloys contain a small quantity of tin:—6 oz., Bristol brass, and brass that can be soldered; 8 oz., ordinary brass, or common ingot brass, made by simple fusion of the two metals; 9 oz. to 10 $\frac{1}{2}$ oz., Muntz's patent sheathing, which can be rolled and worked at a red heat; 12 oz., Spelter solder, for copper and iron, also pale yellow metal, fit for dipping in acids; 16 oz., soft spelter solder for ordinary brass-work; 16 $\frac{1}{2}$ oz., Hamilton and Parker's patent mosaic gold—this is dark coloured when first cast, but on dipping assumes a beautiful golden tint—when cooled and broken the yellowness disappears, and the tinge varies from reddish fawn or salmon colour to a light purple or lilac, and from that to white; 32 oz., a bluish white, brilliant, brittle alloy, which can be pounded cold in a pestle and mortar; 128 oz., a hard crystalline metal, more tenacious than zinc, and sometimes used for laps or polishing disks. Brass from 8 to 16 oz. is used for the various brass articles in furniture &c.; the metal is first annealed before it is scoured or cleaned, or before the acids, lacquers, or bronzes, are used. Brass that files and turns well is from about $4\frac{1}{2}$ to 9 oz.

The arrangements of the brass foundry are shown in Fig. 125, in

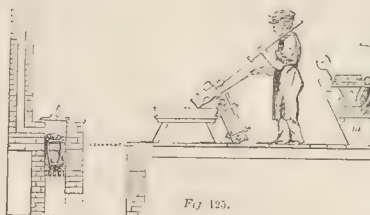


Fig. 125.

which *m* is the moulding-trough for the sand. In the centre is the pouring or spill-trough, and at *t* is the furnace, usually built within a cast-iron cylinder erected over the ash-pit, and reached by a loose grating on a level with the floor of the foundry. The mouth of the furnace is 8 or 10 inches above the floor, and its central aperture is closed with an iron plate *t*, called a *tile*. Three or four such furnaces usually stand in a row, and separate flues proceed from each into a large stack. The fuel is hard coke, broken into lumps about the size of hens' eggs. The pot or crucible is first raised to a red heat with the mouth downwards, and then being placed in its proper position in the fire, a charge is put in, and left until the metal is run down. When the alloy is formed, from 10 to 20 hours being required for the purpose, the heat is increased so as to fuse the whole. The tile *t* is then removed, and the crucible taken out of

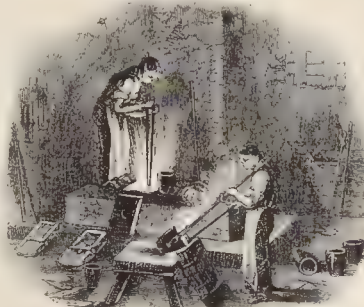
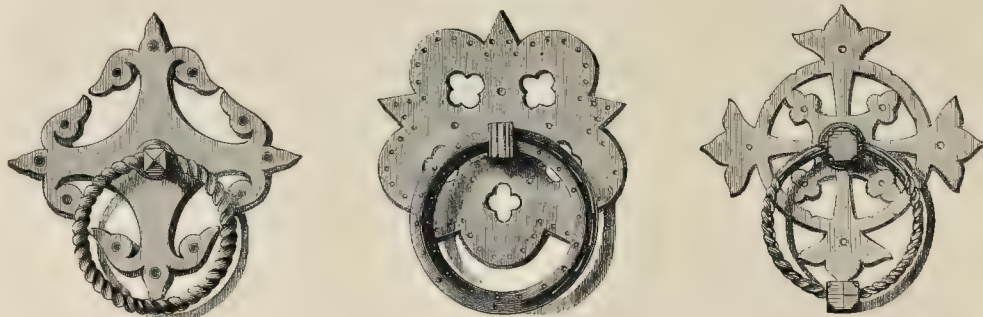


Fig. 126—BRASS FOUNDRY.

the furnace by means of a pair of tongs. The refuse is skimmed off, and the contents are poured into an iron mould, placed in a sloping direction, the stream being guided by means of an iron rod. The

exposure of the molten brass to the air during the pouring liberates dense fumes of oxide of zinc, an imperfect protection from which is adopted by the men, by tying a handkerchief over the mouth and nostrils during the casting. The ingot of brass thus formed is in some cases broken up and fused a second time with fresh zinc, or calamine and charcoal; but a good malleable brass may be produced at a single fusion, provided the materials are good. If the brass is to be rolled into sheets, or made into wire, it is cast into plates.

It is not necessary to notice the various articles in brass produced at Birmingham by casting. The operation does not greatly differ from that already described for cast articles in iron. There are, however, a few articles in brass produced in enormous quantities,



Figs. 127, 128, 129.—BRASS DOOR-HANDLES, BY MESSRS. HART.

which require to be noticed, such as buttons and pins. Gilt buttons are made of sheet-copper with a small alloy of zinc. It is supplied in strips of the exact thickness, and is first cut into round disks or blanks by means of a circular cutter or punch at an ordinary fly-press. Besides the common gilt button, which is flat on both sides,



Fig. 130.—PUNCHING BLANKS.

a convex button—such as is worn by pages—is very common; to produce which the flat blanks are placed one at a time in a fly-press, furnished with a concave mould and a convex punch, which being brought down upon the soft metal, forces it into the bed, and gives it the required shape. Some buttons are convex in front, and closed in behind with another piece of metal, also convex on the outer surface, but less so than in front. Such are called *shell* buttons. The two pieces are made separately, and are brought together by the action of a die and a punch, whereby the edge of the shell is bent over, and lapped neatly down upon the button without any soldering. Metal buttons, with holes through them instead of a shank, are made by first stamping out the blanks, next punching them a little concave in the middle, then punching out the holes, and next rubbing down their edges with a blunt steel tool, to prevent them from cutting the thread.



Fig. 131.

The flat blanks, as formed by punching, are sharp at the edges;

these are smoothed and rounded between two parallel grooves of steel (Fig. 131), about 18 inches long, one movable and the other fixed. A semi-circular opening in each grooved piece coming together once during each revolution of the handle, allows a blank to be dropped into the grooves, which blank, revolving as it proceeds between the two pieces of steel, reaches a hole at *a*, where it falls into a basket beneath. The blanks are next planished under a polished steel hammer, and are now ready to receive the *shanks*. These are made of brass wire in a machine, in which a coil of wire gradually advances one end to a pair of shears, where short pieces being cut off, a metal finger presses against each short piece in the middle, bending it, and forcing it

between the jaws of a vice, which compress it so as to form an eye. A small hammer then strikes the two ends, flattening them, and finishing the shank, which is now pushed out of the machine. The shanks are placed on the blanks, and are held in position by means of a small spring clasp of iron wire; a small quantity of solder and resin are applied to the spot where the shank is to be fixed, and several hundred blanks being thus prepared, are placed on iron plates in an oven, when the solder melts, and afterwards, on cooling, firmly unites the shank to the blank. If the button is to be decorated with a crest or inscription, this is raised by stamping; a die containing the crest or device is attached to a heavy weight or *monkey*, moving between two upright posts, suspended by a cord passing over a pulley, and ending in a stirrup-iron, into which the workman inserts his foot. In the bed is another die, containing the maker's name and a hole for the shank. In this way blanks are ornamented with ease and rapidity (Fig. 132). The buttons are cleaned in a weak solution of nitric acid, and silvered in a mixture of silver, common salt, cream of tartar, and some other ingredients. If required to be gilt they are made chemically clean, and immersed in a solution of nitrate of mercury, which covers them with a thin film of mercury. The gold is made into an amalgam with mercury, into which buttons are immersed, or only their faces are brushed over therewith. Such is the divisibility of gold, that from $2\frac{1}{2}$ to 5 grains of the precious metal are sufficient to gild 144 one-inch buttons.

The gold is made to appear by driving off the mercury by means of heat, for which purpose the buttons are put in a cage, and placed within a furnace arranged so as to condense and preserve the fumes of mercury. The cage is kept in constant motion by a woman seated before the furnace, as shown in Fig. 133. After this operation the gold is of a dull dingy colour, but it is made resplendent by burnishing in a lathe with bloodstone.

Covered buttons are now made in enormous quantities, and much ingenious machinery has been contrived for producing them cheaply and quickly. The parts of a common Florentine button are very numerous, and are cut out at the fly-press. First there is a metal shell, a front and side view of which is shown at No. 1, Fig. 134;



Fig. 132.—THE STAMPING-PRESS.

secondly, a metal collet, with an oblong hole for the shank of the button (No. 2); a circular piece of silk or other woven material



FIG. 438.—DRESSING-UP.

(No. 3); the padding (No. 4), which lies under the collet, and has a thread wound round it at right angles with the oblong hole of the collet—this padding is made up of several layers of soft paper and a

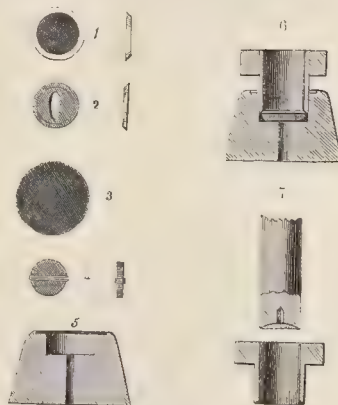


FIG. 154.

layer of silk over them, the whole forming the back of the button. In putting the parts together, No. 3 is placed on the face of a mould No. 5, No. 1 is placed on the silk, and the two are pressed to the bottom by means of a punch, which being removed, a hollow tool (No. 6) is forced into the die, by which the edges of the silk are brought towards the centre, and made to overlap the shell; the collet (2) with the padding (4) is next dropped into the mould through a hollow tool (7); a punch passed down the hollow tool forces the padding and the edges of the outer covering of the button into the shell. The button is now removed by passing a wire up through the bottom channel, and a final pressure is given to the button by a punch with a plane face. In this kind of button the place of shank is supplied by a portion of the material projecting from the hole in the collet No. 2.

Pins are produced from wire, which is furnished to the pin-maker in a soft state, and his first operation is to make it clean, hard, and of the proper size; for which purpose it is pickled in dilute sulphuric acid, washed, beaten, and dried, wound on a barrel, and passed through a draw-plate, by which it is reduced to the proper size, and made hard and bright. It is then pulled through another draw-plate to straighten it, and is run out upon a low wooden bench or trough 20 ft. long, and cut into lengths of 20 ft., which are again cut with shears into shorter lengths, each sufficient for about 6 pins. These pin wires are pointed at each end at a wheel or mill, consisting of a circular single cut file, as many as 50 or 80 being applied

at a time, the grinder spreading them out, and giving them a rotatory motion between the thumb and fingers. The points are finished on a finer wheel. Good ventilation is as necessary here as in the case of needle-grinding, for the brass dust entering the eyes produces blindness, and being inhaled leads to consumption, and also to the curious effect of turning the hair of a green colour. A pin or blank is cut from each end of the pointed wire, and the intermediate portion has its blunt ends again pointed. Two more shafts are cut from the wire, the intermediate portion is again pointed, and divided in the middle, forming two more pin-shafts. The heads are prepared from a finer and softer wire, which is first wound in a close coil round a mould-wire 40 inches in length, of the thickness of the pin, for which purpose the mould is attached to the spindle of a Jersey spinning-wheel, and the heading wire being attached to the end of the spindle, is passed with the mould through two small loops in a wooden handle, which the attendant holds in her left hand to regulate the winding, while she turns the wheel with her right. As the mould-wire rotates, the heading-wire being held to it at right angles, is gradually coiled upon it, and when slipped off is cut up into heads, each head being formed of 2 or 2½ turns of the spiral. The heads are cut by means of a sharp chisel, fixed vertically in a wooden frame, and held down by a spring; a lever from the upper part of the chisel, becoming engaged for a moment in one of the cogs of a tappet-wheel, is depressed, while the chisel is raised, but the lever immediately escaping from the cog, the chisel is forced down by the spring. Other cogs instantly coming into action, and being released in the same way, a chopping motion is thus produced, and the spirals, placed on a horizontal board, are gradually advanced under the edge of the chisel in such a manner as to cut off two turns from each spiral at each descent of the chisel. The pin-shafts are headed by a boy, seated with a number of heads in his apron, who, taking a number of the shafts in his hand, passes them through the heads, when the wires catch up each a head, or it may be 2 or 3. The superfluous ones being removed, the shafts are ready for moulding, or fixing the heads securely; for which purpose the pins are placed, points downwards, one at a time in a steel die, the counterpart of which is attached to a hammer, moving in vertical guides, and regulated by a treadle acted on by the foot of the workman. A single blow of this hammer on the top of the pin shapes the head and fastens it. A small spring below the die raises the pin immediately after the blow, and enables the man quickly to remove it and substitute another. The pins are next cleaned by boiling in sour beer, wine lees, or a solution of tartar, and they are whitened or tinned by being interstratified with grain-tin, to which cream of tartar and water are added, the process being assisted by heat. After this the pins are polished by being agitated in a leather sack filled with bran, and this being separated by winnowing, the pins are ready for papering. The papers are grooved with crimping irons, and two of the folds being gathered together, are placed between the jaws of a vice, with a small proportion projecting. The vice closes with a slight spring, and has grooves at the top to regulate the distances of the pins. A girl, seated before the vice with a lapfull of pins, passes a hand-comb through them, and collecting the pins thus caught up in her fingers, presents the points to the channels of the vice, and drives the points into the paper; then opening the vice, she brings up a couple more folds of the paper, and proceeds as before. Mourning pins are covered with a black varnish instead of being tinned, but it is not uncommon to form such pins of iron or steel wire, rendered deep blue or purple by the action of heat. Pins are also produced by machinery, although hand-made pins appear to be quite as cheap; and in order to form the solid head by jumping up the end of the wire, a softer wire is required, and hence machine-made pins are liable to bend.

Birmingham has been distinguished of late years for its dazzling displays of electro-plated and electro-gilt goods. The art of electro-metallurgy, or electrotype, owes its origin to the fact that when a voltaic current is passed through a metallic solution, decomposition takes place; the metal in a revived form attaches itself to the negative pole or *electrode*, while the acid or alkali goes to the positive pole. This principle may be applied in a vast number of ways, and with almost endless forms of apparatus. In the production of plated goods, or the deposit of silver upon a baser metal,—such as copper, brass, and German silver, which are much more readily plated than iron, tin, zinc, pewter, or Britannia metal,—a solution of cyanide of silver, dissolved in cyanide of potassium, has been found best adapted for obtaining the silver precipitate. The articles

to be plated are cleansed from grease by being boiled in an alkaline lye, then washed and dipped in dilute nitric acid, for removing any oxide from the surface: they are next brushed with Isle of Wight sand. Each article is then suspended by a copper wire, dipped for a moment into nitric acid, then into water, and then suspended in the silver solution from the wire which crosses the mouth of the vessel from the zinc of the battery. The article is instantly coated with silver, and after a few seconds is taken out and brushed with a hard hair brush and a little fine sand, or if the article be large, with brushes of brass wire, attached to a lathe, the object of this brushing being to remove any particles of foreign matter which might prevent the perfect adhesion of the silver. The article is replaced in the solution, and in the course of a few hours a coating of the thickness of tissue paper is deposited upon it, having the beautiful matted appearance of dead silver. If this appearance is to be preserved the article must be taken out, and immersed for a few minutes in boiling distilled water. If it is a medal it should be immediately put into an air-tight frame; if a figure, under a glass shade, as it tarnishes in a few days by the formation of sulphuret of silver in the air of rooms where there is a coal fire or gas burning. If the article is not to have a dead surface, it is brushed with a wire brush and old ale or beer, after which it is burnished with polished steel or bloodstone.

The voltaic battery must be so arranged that the quantity of electricity generated may give the required coating of metal in a given time, and the intensity sufficient to cause the electricity to pass through the solution to the articles. The plates of metal forming the positive pole in the solution should correspond in surface to the articles to be coated, and face them on both sides. In Fig. 135 the

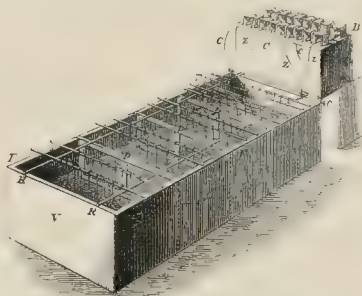


Fig. 135.

vat, or plating-vessel, *v*, is about 61 ft. long, 33 inches broad, and 33 inches deep, and contains from 200 to 250 gallons of solution. The silver plates used as electrodes are fixed upon light iron frames. Two battery troughs, arranged as at *B*, consist of 6 batteries of 3 pair intensity. The zinc plates are each 6 inches by 7 inches, thus giving 504 square inches from which electricity is disengaged. The zinc pole *z* is connected with the rods *rr*, and the copper pole *c* is connected with the metallic sheets *rr* in the solution, by means of the copper slip *r*. The surfaces of the silver electrodes exposed to the articles receiving the deposit vary from 3000 to 4000 square inches. *DD* are articles suspended in the solution by wires from the rods *rr*. As soon as the articles, which are connected with the negative pole of the battery, and the metallic sheets connected with the positive pole, are both immersed in the solution, the voltaic circuit is complete. The amount of metal deposited is ascertained by weighing the articles before and after plating, allowance being made for the loss occasioned by dipping in nitric acid. Any thickness of silver may be given to a plate by allowing the action of the battery to continue sufficiently long. From 1½ oz. to 1½ oz. of silver to the square foot of surface forms a deposit about as thick as ordinary writing-paper, and forms an excellent plate. To prevent the deposit from being made unequally, and the silver from being porous, the article should be kept in motion, for which purpose some simple machinery is usually attached to the vat, and is moved by engine-power or by clockwork. When the articles are taken out of the solution they are dipped in water, then put into boiling water, and dried in hot sawdust. Their colour is chalk white. After being weighed they are brushed with fine wire brushes and stale beer, which produces the appearance of bright metallic silver. The chalky

appearance may be prevented, and the deposit have the lustre of bright metallic silver by adding to the solution a small quantity of sulphuret of carbon.



Fig. 136.—JUG IN ELECTRO-PLATE, BY ELKINGTON AND CO.

In the process of electro-gilding the solution is formed by dissolving gold in nitro-muriatic acid, digesting with calcined magnesia, which precipitates the gold as an oxide; this is boiled in strong nitric acid, washed, and dissolved in cyanide of potassium,

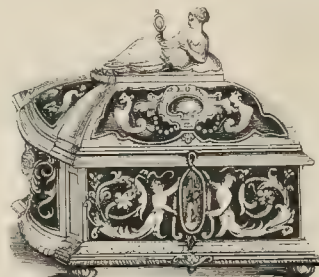


Fig. 137.—TOILET-BOX IN ELECTRO-PLATE, BY ELKINGTON AND CO.

which gives cyanide of gold and potassium. The solution is used at a temperature of at least 130°. The positive electrode of the battery is of gold, the negative of iron or of copper in a porous vessel charged with cyanide of potassium. The articles to be gilt



Fig. 138.—INKSTAND IN ELECTRO-PLATE, BY ELKINGTON AND CO.

are made chemically clean, and the gilding is rapidly performed: a small article may be gilt in three or four minutes. Iron, tin, and lead are difficult to gilt unless a thin coating of copper be first deposited upon them. The solution usually contains from half to

one ounce of gold to the gallon, but for gilding rings, thimbles, &c., and for covering small articles, such as medals, a weaker solution will suffice. For large articles the solution should be of sufficient depth to gild them at one operation, for if a portion of the article be out of the solution, there will be a line mark at the point which touches the surface, and at this surface line metals are acted upon with great rapidity; if the positive electrode is not wholly immersed, it will quickly be cut through at the edge of the water, as if with a knife—an effect which applies equally to silver, copper, and other solutions.

With respect to the quantity of gold deposited much will depend on the uses to which the articles are applied. A few grains of gold will impart a gold colour to a large surface, but it will not last. A mere blush may suffice for articles not subjected to wear, but a good coating should be given to watch-cases, pencil-cases, chains, &c. An ordinary sized watch-case should have from 20 grains to 1 penny-weight of gold, nearly the whole of which should be on the outside, a mere colouring being sufficient for the inside. Such a watch-case in ordinary wear will last five or six years. Small silver chains, sold at about eight shillings each, should have 12 grains of gold; pencil-cases of common size, from 3 to 5 grains; a thimble, from 1 to 2 grains.

It need scarcely be remarked that, in order to cover one surface, or a portion only of one surface of a body, the part not intended to share in the deposit must be coated with wax, or some similar non-conducting body. So also, on the other hand, a non-conducting surface, such as a plaster-cast, &c., may be made conducting by brushing powdered plumbago, or black-lead, over it.

The applications of the art of electro-metallurgy are very numerous. It was at first applied chiefly to the copying of medals and similar works in copper; it has been used for imparting a coating of copper to cornices for decorated buildings, to terra-cotta, wood-carvings, &c. Cloth has been covered and made to appear like a sheet of copper, while retaining the lightness and pliability of cloth. Lace has been covered with copper, and even gilt and made into beautiful ornaments. Table-covers, with metallic ornaments richly gilt, have been prepared by this art; the process has also been applied to the preparing and etching of calico-printers' rollers, to the art of engraving, stereotyping, and many other similar purposes, quite as useful, although they do not make as much show, as electro-plating, which, from the time of its introduction into Birmingham, in 1840, by Mr. Elkington, has gradually risen into an important manufacture there, at Sheffield, and at other places. We give a number of specimens of this beautiful art; the effect produced by them is quite equal to solid silver or gold. They are manufactured in the same manner as silver. The ornamental parts are chased in solid metal, and only hard solder is used for the joints; the base is a purified white nickel metal, very durable, and of the same colour as the exterior. From the nature of the process the deposit forms one body with the base, and no matter how elaborate the style, whether embossed or engraved, it can be plated as easily as a plain surface. With moderate care, such goods may last from ten to twenty years, and when worn can be replated at moderate expense.

In Messrs. Elkington's show-rooms may be seen beautiful specimens of the art, such as flowers and shrubs, with all their delicate details coated with metal—birds and insects, similarly preserved, by being coated with zinc, silver, copper, or gold. Even a spider's web has in this way been covered with gold or silver.

The Birmingham Court contains a large number of locks, which, if not made in Birmingham, owe their origin to the neighbouring Wolverhampton district, and to Willenhall, the centre of the trade. A formidable opposition to this manufacture has arisen in London,

where Mr. Hobbs, an American locksmith, is performing by machinery those processes which had hitherto been executed by hand, and had obtained for the English lock a world-wide celebrity. The Great Exhibition of 1851, however, startled us out of our complacency in this, as in some other subjects on which we had prided ourselves. Our best locks were picked, and our manufacturers were compelled resolutely to set to work so to improve their locks as to defy the efforts of the scientific lock-picker.

The reader is of course aware that in the most common variety of

locks the principle of security is the insertion of wheels or wards, so arranged as to prevent the entrance or revolution of any lever or key which is not formed with corresponding openings, so as to thread its way among them; thus Fig. 140 represents a portion of the interior of a common lock, with two wards attached to the back plate, and the key upon the central pin. The notches in the key must evidently be formed so as to allow the projecting wards

to pass freely into them, or the key would not turn round so as to shoot the bolt. Further security is sought by making the bits of the keys, and also the key-holes, of various shapes, to prevent the introduction of a false key; thus, in Fig. 141, the bits *a b c d* are of different shapes; *e* and *f* resemble *a*, but the portions cut away allow the key-hole to be so contracted in those parts as to prevent the insertion of another key not so indented. It happens however, unfortunately, that the wards of a lock may be very complicated, and an efficient key be of the simplest character. For example, in Fig. 142, the keys numbered 1, 2, 3, are of very different

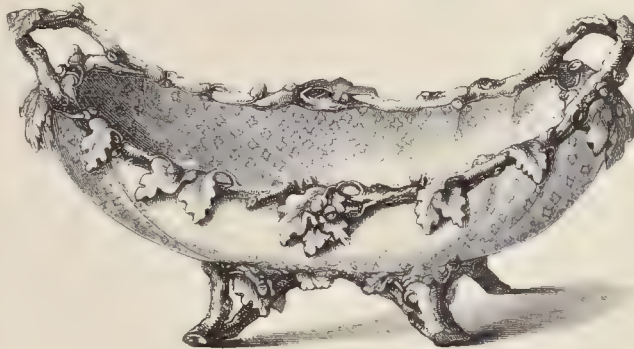


Fig. 139.—BASKET IN ELECTRO-PLATE, BY MESSRS. CARTWRIGHT AND HIRONS.



Fig. 140.



Fig. 141.

pattern; No. 1 has two plain or simple wards; No. 2, two L-wards; No. 3, a T-ward between two plain wards; and not one of these three keys could be substituted for the other in opening their

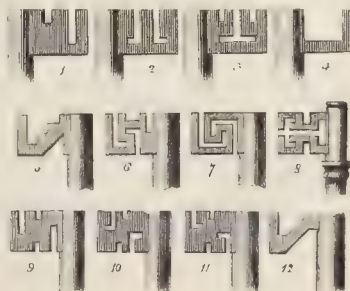


Fig. 142.

respective locks. But it is evident that the only efficient portion in these keys is the extremity of the bit shown in No. 4, which is called a skeleton key, and this will open such locks as the first three keys are intended for without touching the wards. The lock may be made a little more secure by attaching wards to the front as well

as to the back plate, in which case the key must be furnished with corresponding notches, as in No. 5; but in such a case, a simple pick like No. 12 would open such a lock, the theory of *master-keys* being founded upon such defects. The keys No. 9, 10, and 11, so far differ from each other that no one of them could be substituted for the other, and yet the fourth, or master-key (No. 12), would open all three, and even a whole suit of locks constructed on the same principle. Indeed, it would be possible to make locks for all the doors of all the houses in London, with a distinct and different key for each lock, and yet with one master-key to open the whole. Such keys as Nos. 6 and 7 represent good forms of wards, but such keys are weak, and will not bear much wear and tear. No. 8 is a key with a solid shank, adapted to a lock which can be opened on both sides. All the other keys are called pipe-keys, adapted to locks with a central pin, and can be opened on one side only.

The second principle of security in locks is the introduction of tumblers. A tumbler is a sort of spring-latch which detains the bolt of the lock, so as to prevent it from moving until the key in turning lifts the tumbler out of contact with the bolt before moving

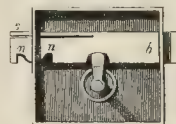


Fig. 143.



Fig. 144.

it. Figs. 143, 144, will show the difference between a warded and a tumbler lock, and the means by which the bolt is kept in the position in which it is left by the key. Fig. 143 is a *back-spring* lock; the bolt *b* is represented as half-shot, or half-locked, and it can be moved either to the right or to the left by the action of the bit of the key within the semi-circular cavity of the bolt. At the top of the bolt is a spring *s*, formed by cutting a strip of metal from the bolt itself, and bending it so that its upward pressure causes the bolt to press upon the edge of the rim. When entirely locked or unlocked, one of the notches *n* or *n'* falls into the edge of the rim, and holds the bolt; when half-locked, as in the figure, the convex surface between the two notches rests upon the edge. This lock is open to the serious defect that the bolt can be moved backwards or forwards by applying pressure to either end of it—a defect which is got over in the tumbler-lock, Fig. 144, where, instead of the spring *s*, Fig. 143, the bolt *b* has two notches *n'* in its upper edge, and behind the bolt is the spring-catch or tumbler *t*, moving on a pivot at one end, and pressed down by the action of a spring on its upper edge. The portion of the tumbler concealed by the bolt is represented by the dotted line. At the upper angle of the tumbler is a projecting stud or stump *s*, which, when the bolt is fully shot, falls into the notch *n*, and holds it until the key is inserted, the bit of which touches the lower edge of the tumbler, raises the stump out of the notch, and releases the bolt, which can be shot forward until the notch *n'* comes under the stump which falls in and secures the bolt. It will be evident from this arrangement that no pressure applied to either extremity of the bolt will have the effect of shooting it.

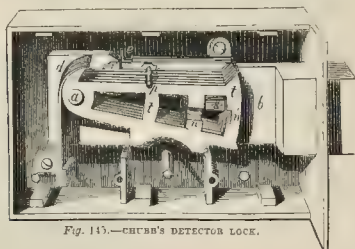


Fig. 145.—CHUBB'S DETECTOR LOCK.

Such is the tumbler-lock in one of its simplest forms. Fig. 145 represents a complicated form of tumbler-lock, consisting of six distinct double-acting tumblers, and a detector, by which if, in an attempt to pick or open the lock with a false key one of the tumblers be lifted too high, it is retained, and can only be released

by the application of the true key; *b* is the bolt into which is rivetted the stump *s*; *t* are the six tumblers moving on the centre-pin *a*; *d* is a divided spring pressing upon the ends of the six tumblers; *e* is the detector-spring; and it will be noticed that the back-tumbler has a projecting piece near the detector-spring, with a stud or pin *p* fixed into it. Fig. 146 is the key. It is evident that the bolt *b* is held by the stump *s* pressing against the shoulders of the tumblers, and that the bolt cannot pass unless the tumblers be raised to such a height as to allow the stump to pass through the gatings of the tumbler at *n*. There are no ordinary means of ascertaining when any one tumbler is lifted too high or not high enough, and it is still more difficult to ascertain the combination of the six. Should a false key be inserted, and one of the tumblers be raised beyond its proper position, the detector-spring *e* will catch the back tumbler, and hold it so as to prevent the bolt from passing, and on the next application of the true key it will be discovered that a tumbler has been over-lifted in the attempt to pick the lock, as the true key will not at once unlock it. But by turning the key the reverse way, the tumblers will be brought to their proper bearing, and allow the bolt to move forward, and the stump to enter the notches *n'*: the bevelled part of the bolt will then lift up the detector-spring, and allow the back tumbler to fall into its place. The lock can now be opened and shut in the ordinary manner. By means of the pin *p* attached to the back tumbler, and extending across the other five, should any one be raised too high, it would raise this pin so as to catch into the detector-spring. The action of the bit of the key in raising the tumblers is for the lowest step, or that next to the end of the key, to operate on the bolt, while the other steps move the tumblers to the exact height necessary for the stump to pass. By varying the length of these steps, endless varieties of lock may be contrived. During the Great Exhibition of 1851, the startling announcement was made that such locks as the above admitted of being easily picked. Mr. Hobbs, an American locksmith, embodied the art of lock-picking in the following axiom:—"That wherever the parts of a lock which come



Fig. 146.

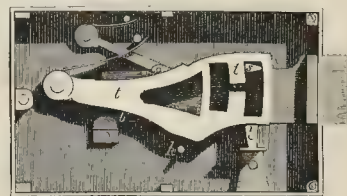


Fig. 147.—HOBBS' PROTECTOR LOCK.

in contact with the key are affected by any pressure applied to the bolt, that lock can be picked." In picking such a lock as that represented in Fig. 145, a skeleton bit was inserted in the lock, turned, and made to act with pressure against the bolt *b*, the effect of which pressure would be to bring the stump *s* up against the shoulders of the tumblers. A second skeleton bit being then introduced, each tumbler is gently raised until pressure ceases to be exerted; the last tumbler being thus operated on, the bolt will pass. To prevent such pressure being applied with effect, Mr. Hobbs contrived a lock represented in Figs. 147, 148, 149, in which *b* is the bolt, *t* the tumblers, with the usual slots or gatings through which the stump *s* must pass when the bolt is being shot or unshot. Now instead of rivetting this stump firmly into the bolt, it is attached to a piece of metal shown separately in Fig. 148, the hole *h* fitting on a centre-pin in a recess formed at the back of the bolt, and the stump, passing through a slot in the bolt, occupies its usual position in tumbler locks. There is also a small binding spring to prevent the piece from turning of itself. When the key, Fig. 149, is applied to the lock, and the tumblers are properly adjusted, the stump, meeting with no obstruction, passes through the gating of the tumbler; but should an



Fig. 148.



Fig. 149.

attempt be made to shoot the bolt before the tumblers are all properly raised, the stump, meeting with a resistance, turns the piece to which it is attached in its centre, and brings the tongue *p* into contact with a stud rivetted into the case of the lock, thereby preventing the possibility of withdrawing the bolt, at the same time releasing the tumblers from any pressure, so that their position cannot be ascertained. In Fig. 147, *d* is a lever catching into the top of the bolt, serving as an additional security against its being shot back, *k* is the pin on which the key turns, and *r* is a piece on which the tumblers rest.

In return for the compliment of picking Mr. Chubb's lock, Mr. Chubb picked Mr. Hobbs's, the effect of which competition led both parties to study the weak points of their respective inventions, and to introduce such improvements as to render their locks, if not absolutely inviolable, at least more safe than locks have been at any former period. Other inventors, too, have come forward with many ingenious combinations, all tending to security. Among these must be mentioned Mr. E. B. Denison's lock, Parnell's, Puckeridge's, and Cotterill's, the last of which has, we believe, resisted the efforts of

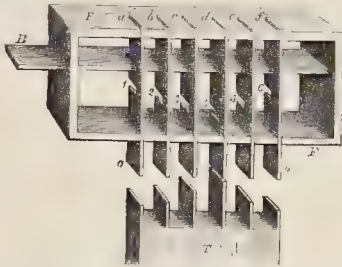


Fig. 150.

Mr. Hobbs to pick. Our object is not in this place to give a treatise on locks,* but merely to state a few leading principles in their construction, to enable the reader the better to enjoy his visit to the Birmingham Court. We may therefore conclude this part of our subject by briefly describing the principle of the Bramah lock. In Fig. 150, *B* is a bolt capable of being moved backwards and forwards in the rectangular frame *F F*. In this bolt are six notches, into which are exactly fitted the six slides *a b c d e f*, and it will be seen that, in the represented position of these slides, the bolt *B* cannot move. These slides admit of being moved up and down in the notches of the bolt *B*, and they are themselves furnished with notches 1, 2, 3, 4, 5, 6. If by any means the slides be so raised that all their notches coincide with the bolt, it is evident that the bolt can then be moved backwards and forwards. Such an elevation of the slides may be brought about by means of the tally *T*, which, being pressed against the lower ends of the slides, will raise them all unequally, but sufficiently to bring their notches into one horizontal line, and thus allow the bolt to pass. If only the lower ends of the slides be exposed to view, it is evident that without such a key or tally it would be difficult, if not impossible, to ascertain how far to press in the sliders, so as to

allow the bolt to pass. The Bramah lock is an ingenious application of such an arrangement.



Fig. 152.

Messrs. Chubb have attracted attention to their locks in an especial manner by exhibiting some beautiful designs, one of which is represented at Fig. 151. It is of pure polished steel, excellent in execution.

The lock and key, Fig. 152, are by Mr. J. Gibbons, jun., of Wolverhampton. He calls it an improved lock for doors, park-gates, &c.

Conspicuous among Birmingham wares are the multifarious works in *papier maché*, often painfully forcing themselves upon the attention by over-ornamentation, impossible landscapes, and mother-of-pearl rivers and moonlights, which tell sad tales

of misapplied labour and ingenuity. Many articles, however, are in good taste, and such specimens, we hope, are rapidly on the increase. The visitors to the Great Exhibition will probably remember the large collections of japanned ware from Japan and China, and will agree in the remark of the Jury Report which

* The reader interested in locks is referred to one of Mr. Weale's series, entitled, "Rudimentary Treatise on the Construction of Locks," edited by Charles Tomlinson. London, 1853.

refers to them, that "vulgar forms and bad ornament are not necessarily connected with cheap manufacture."

Articles in papier maché are produced by pressing the pulp of paper between dies, or by pasting paper in sheets upon models; when dry, the articles are varnished, japanned, and ornamented.

Various cheap articles are manufactured in Paris by the first process, out of the paper and paste supplied by the bill-stickers, whose bills are pulled down by night, mashed in water, and pressed in moulds.



Fig. 153.



Fig. 154.



Fig. 155.

By the second method, as conducted at Birmingham, unsized paper is saturated with a solution of flour and glue, and is applied to an iron, brass, or copper mould in repeated layers, a drying heat of about 100° being applied after each coat. When suffi-

ciently thick, the shell thus formed is removed from the mould, planed and filed to shape. A tar varnish, mixed with lamp-black, is laid on, and the article is stoved. Other coats of varnish are added, the stoving being applied after each varnishing. The in-



Fig. 156.

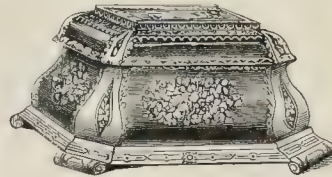


Fig. 157.



Fig. 158.

ciently thick, the shell thus formed is removed from the mould, planed and filed to shape. A tar varnish, mixed with lamp-black, is laid on, and the article is stoved. Other coats of varnish are added, the stoving being applied after each varnishing. The in-

to admit the tea-urn nearer to the dispensers of the tea, the urn being placed in the deeply indented portion. The tray to the left is richly inlaid with patent pearl ornaments. The design of the other tray is plainer.



Fig. 159.

equalities are removed with pumice-stone, and the ornament is next applied in bronze-powder, gold, or colour. Shell-lac varnish is put on with several coats; the article is again stoved, and polished with rotten-stone and oil, and finished by hand-rubbing.

The Birmingham firm of Jennens and Bettridge is celebrated for

Papier maché architectural ornaments are prepared by glueing sheets of brown paper together, and pressing the paper into a metal mould of the ornament required; the moulded paper is trimmed to shape, and a composition of paper pulp, rosin, and glue, is put into the mould, and the paper being again inserted and pressure applied,

the composition adheres to it, and produces a sharp, well-defined ornament. *Carton-pierre* ornaments are formed of paper-pulp, whiting, and glue, pressed into plaster piece-moulds backed with paper, and when sufficiently set, hardened by drying in a hot room. Fig. 160 is a candelabrum in wood and carton-pierre, gilt in



Fig. 160.

imitation of or-molu; it stands eight feet high, and was exhibited by Mr. G. Brown, of London.

In a general display of Birmingham goods, lamps and their accompanying decorations are conspicuous objects. It is not necessary to describe the various processes of casting, &c., by which a lamp is produced. We prefer to give a few particulars respecting the principles on which lamps are constructed. A lamp does not differ from a candle in its action, for in a candle, just below the flame, a cup of melted matter is formed, which is drawn up to feed the flame by the capillary attraction of the twisted wick. In a lamp the oil is drawn up in a similar manner, but the reservoir for supplying the wick is at some distance from the oil which is about to undergo combustion. The antique lamp, Fig. 161, is constructed with great simplicity, although made the subject of artistic beauty. It consists

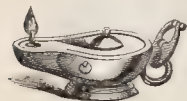


Fig. 161.

simply of an extended open or closed vessel, with an unspun wick rising through a hole in the beak. In such a construction the oil raised by the wick varies in quantity with the supply in the lamp; combustion takes place only on the outside, where the air is in contact with the flame, and as the amount of carbon liberated from the oil is greater than can be appropriated by the oxygen surrounding the flame, some of the carbon must escape unconsumed in the form of smoke.

Moreover, the shadow cast by such a lamp must greatly interfere with its illuminating power. The shadow may be diminished by bringing the flame forward away from the vessel, as in the old

kitchen lamp, Fig. 162, where, in proportion as the distance between the beak and the reservoir is great, so the angle bac becomes more acute, and consequently the shadow less.

In the construction of a good lamp the wick should be so arranged that the quantity of oil decomposed by the heat, and the supply of air required for its combustion, bear such a relation to each other that the hydrogen and carbon of the decomposed oil pass off as vapour of water and carbonic acid without the production of any visible smoke. The second point to be attended to is to maintain the flame at the same distance from the surface of the oil, so that the capillary action of the wick may remain the same; thirdly, the oil vessel should be placed so as to throw as little shadow as possible; fourthly, the light should be thrown by means of collectors, or reflectors, from those parts where it is of little use into directions where it is most required. In the *Argand lamp*, a cylindrical wick

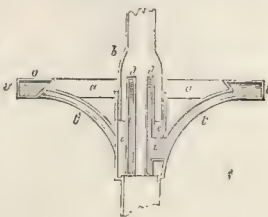


Fig. 163.

is used, and the air which supports the combustion is directed by means of a glass chimney and other arrangements up through the cylinder, as well as along its exterior. The burner is formed of two metallic cylinders c d , Fig. 163, one within the other, the annular space between them, which is closed at the bottom, contains the wick and a portion of the oil. The oil vessel v v surrounds the burner at some distance, and supplies this annular space with oil by means of the tube z , the other tube t' being a counter support for the oil vessel. The inner cylinder is open both at top and bottom, so that the flame is surrounded by two concentric currents of air, which, assisted by the glass chimney, stream in through openings below with considerable force, placing the flame in the condition of a small furnace, in which combustion is rapid but perfect, and the heat and the light great in proportion. The glass chimney first used was a simple, straight cylinder, but this was found to supply too much air, the excess serving not to feed the flame, but to cool it. This was remedied by contracting the diameter of the glass at a certain height above the burner, as at b , so as to form a shoulder against which the air should impinge, and thus be directed to the flame. Various forms have been given to the oil vessel for diminishing the shadow. In Phillips's *Sinumbra lamp*, the three



Fig. 164.

surfaces of the oil vessel, Fig. 164, meet in the form of a flat wedge, the sharp edge of which is directed towards the flame. The position of the flame with respect to the oil vessel is such that two tangents drawn from the apex and base of the flame to the oil vessel meet a few inches behind it in x , Fig. 165. Beyond this the vessel can cast no shadow, and within the space where the shadow is cast it is destroyed by the ground-glass shade. The wick is moved as follows:—the inner cylinder f is furnished with



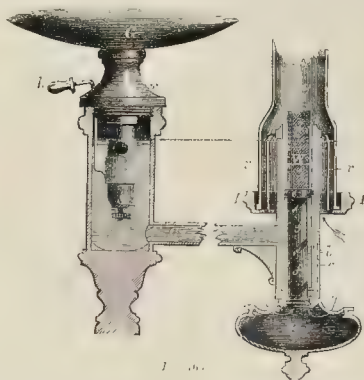
a spiral groove, into which the short peg a of the wick-holder e fits. On turning the holder round, the peg moves along the groove, and forces the holder up or down. The holder is turned by the cylinder d , which has a long slit in its side, into which a second peg b , attached to the outer side of e fits. By this arrangement d can be moved freely up or down, taking with it the wick-holder. In order that d may move easily, it is attached to the support of the chimney, and terminates at the upper part in a thick ring, which rests upon the edge of the cylinder c , made lower for the purpose, and thus the whole



Fig. 166.

is brought up to the full height of the burner. The supports for the chimney are fixed in this rim, on turning which by hand *d* is at the same time moved, and with it the wick.

In what are called *fountain reservoir lamps*, the oil vessel is placed on one side of the burner, so that its shadow may fall upon the wall, or to that part of the room where the light is least wanted. The reservoir may consist of an ornamental globe or vase *g*, Fig. 166,



from the lower part of which proceeds a tube, closed at the bottom by a thumb-screw *s*. There is a hole in the side of the tube, which can be opened or closed by depressing or raising the short cylinder *s* by means of its handle *h*. The globe is filled by pouring oil into the lower opening while the vessel is inverted and the hole closed. The screw is then put in, the vessel turned over and screwed into the neck of the oil cistern *o*. On depressing the handle *h*, the oil flows out, passes along the tube *c*, and ascends to the wick as far as the dotted line. As the oil is consumed and falls below the level of this line, air enters the oil cistern through a hole at *x*, a bubble of air passes up through the hole, and a corresponding quantity of oil escapes from the reservoir, thus maintaining the level marked by the dotted line. When the lamp is extinguished the handle *h* is drawn up, thus cutting off the supply of oil. The arrows show the direction of the double current of air, and *x* is a cup for catching any oil that may overflow. *w* is the circular wick attached to *s* the wick-holder, which slides up and down on the tube *f*. *II* is the gallery for supporting the glass chimney *g*.

To get rid of the shadow, lamps have been constructed with the oil vessel at the foot, the oil being raised by various kinds of apparatus. In Girard's lamp the oil is raised by the compression of air. In Keir's *hydrostatic lamp* the oil is raised to the wick, and sustained by a column of a solution of salt and water, of such density that it will balance a column of oil 4-3rds its own weight. In some forms of lamp the oil is raised by a pumping apparatus placed with the oil in the pedestal. In Carcel's *clockwork or mechanical lamp*, the oil is pumped up from the foot of the lamp by clockwork, in such quantity as to exceed its consumption, the unconsumed portion flows back over the outside of the burner to the reservoir, making it necessary to screw up the wick higher than in common lamps, and hence the flame being raised more above the edge of the burner, no carbonaceous matter is produced on the wick or about the edge to interfere with the regular flow of oil. Carcel's lamp has been modified and improved in various ways, among which may be noticed Meyer's *elliptic lamp*. It is adapted to the combustion of crude vegetable oils; the oil is contained in the foot in a cylindrical vessel, in which a leathern piston or valve is worked up and down by means of a rack and pinion. At the top of the solid stem of the lamp is a strong spiral spring, which presses on the piston so long as it is above the bottom of the oil vessel. Between the coils of this spring, and passing air-tight through the piston, is a tube terminating in a funnel-shaped mouth in the oil-vessel; this mouth is covered with a perforated dish for straining the oil. The oil is forced up this tube to the burner, on approaching which it receives a fine silver tube several inches long, and 1-30th inch internal diameter, surrounded by a cup of wire-gauze of tinned copper for straining the oil. The resistance offered by this narrow tube regulates the

flow of oil, and its length and bore are so proportioned to the force of the spring that enough oil is brought up to supply the flame with an additional quantity to overflow and keep the metal parts of the wick cool. The lamp is filled with oil at a point above the spiral spring, and it flows down and rests on the top of the piston; then by winding up the rack-work with a key, the piston is raised to the top of the cylindrical oil vessel; the ascension-tube with the burner attached is next pushed down by hand through the piston, and the oil is thus brought into a position below the piston, when the spring, in forcing the piston down, raises the oil. In pressure lamps the management of the mechanism involves much trouble and requires some experience, and must, we should think, be liable to get out of order.

In Parker's *economic or hot-oil lamp*, the oil vessel is placed above the flame, the object being to throw the shadow in a direction where it cannot interfere injuriously with the light, and also to overcome the consistency of crude whale oil. In this lamp *R R*, Fig. 167, is the oil vessel, a double cylinder of metal surrounding

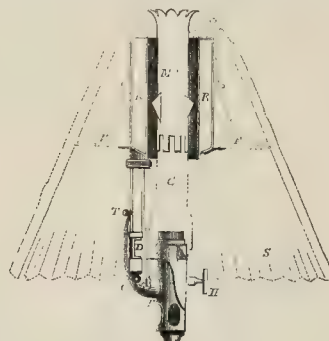


Fig. 167.

the upper part of the chimney. The hot oil descends by the arm *a* to the burner; this arm has a slide valve *D*, worked by a trigger *T*, by raising which the supply of oil can be cut off, and the oil vessel removed to be filled. The flame is regulated by raising or lowering the bell-mouthed chimney-glass *G*, which rests upon three points below, and is moved by rack and pinion *H*. The wick is not movable as in ordinary lamps, and a fresh wick must be inserted every time the lamp is used. A frame *F* supports a shade *S* of glass or paper.

The facility with which volatile oils liberate their carbon renders them generally inapplicable to the purposes of illumination; they may, however, be used by increasing the draught of air, or by lessening their percentage of carbon by dilution. Thus oil of turpentine, mixed with four parts alcohol of 90 per cent. strength, has its carbon reduced from 88 to 63 per cent., and the lamp for burning such a mixture is shown in section Fig. 168; in which *A* is the reservoir, *B* the burner, descending nearly to the bottom, and consisting of a wide metal tube *a a* fitting tightly into another tube *u u*, which surrounds a loose cotton wick *o o*, and fastens it by the semi-circular piece *x*. The tube narrows into *d*, and terminates in a knob *c*, which is the real burner. At the base of *b* are ten or twelve holes $\frac{1}{4}$ inch bore, arranged in a circle. The lamp is lighted by pouring a little spirits of wine into the cup *ee*; inflammable vapour then issues from the holes *b*, which, being ignited, produces the flames *ff* surrounding the knob *c*, the heat of which keeps up the vaporisation. The light is brilliant, but expensive. Mr. Marbe, of Birmingham, has contrived various lamps on this principle.

Lamps without wicks have been contrived for burning naphtha. In Beale's *steam and vapour lamp*, a current of air traverses the naphtha, and becomes saturated with it. In D'Hanen's lamp, the flame proceeds from a knob surrounded by ten holes, as in Fig. 168.

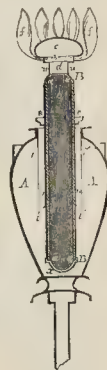


Fig. 168.

Both lamps produce dazzling white flames. Camphine, obtained by distilling oil of turpentine over chloride of calcium, so as to free it from water, is a powerful illuminating body, containing as it does 88.46 per cent. of carbon, and 11.54 of hydrogen; it is decomposed with great ease, and answers well, if properly supplied with air for the complete combustion of its ingredients. Should the supply of air be at all deficient, large flakes of soot escape unconsumed.

Various other forms of lamps might be noticed in connection with the Birmingham trade, such as light-house lamps, railway lamps, &c., of too special a character to call for detail in this place. We must, however, refer to the large amount of employment, and the exercise of taste in connection with lamps and gas-fittings. We give a few specimens by Mr. Potts, of Birmingham, who has done so much to advance the character of the bronze and brass-work of that town. Mr. Potts was the first to introduce the application of a ceramic substance, statuary porcelain, for ornamental purposes in conjunction with metal in chandelier lustres, lamp brackets, &c. (Figs. 169, 170, 171). Fig. 172 is by Mr. R. W. Winfield, of Birmingham; it is a brass lamp with the bowl of semi-porcelain. The group of candelabra, table lamps, and gas-chandeliers (Fig. 173), is by Messrs. Salt and Lloyd, of Birmingham. All the ornaments are from natural objects.

We have thus far illustrated some of the most conspicuous and remarkable manufactures of Birmingham. To give a full notice of all these

of the Great Exhibition of 1851; but, as in many other instances, mechanical skill was generally superior to artistic design. In the various articles intended to supply the every-day wants and the conveniences of life, the contributions of the British

hardware manufacturer are stated in the Jury Report to be "chiefly pre-eminent for excellence of workmanship and material, contrivance, ingenuity, mechanical skill, and other qualities." It is further stated that, "with the advantages of cheap material, superior and powerful machinery, and a commercial demand of such extent as to insure while it invigorates and directs the efforts to supply, British hardware of the commoner sort stands unrivalled in its variety, its utility, and excellence of workmanship, and in its adaption to the wants and wishes of every class of purchasers." The deficiency of British hardware in point of taste is not only due to defective design, but to a disposition among mechanics to bestow a kind of mechanical high polish

and finish upon their work, rather than to make their work subordinate to the due expression and development of the design. Hence accurate modelling can be of no avail if the workman is at liberty to abrade the surface so as to attain that amount of polish and high finish which he thinks necessary to good workmanship.

Before the introduction of machinery, and before the middle classes of society were in a condition to procure or even appreciate works in art-manufacture, the artists and the artificer were usually one and the same individual. Works were thus

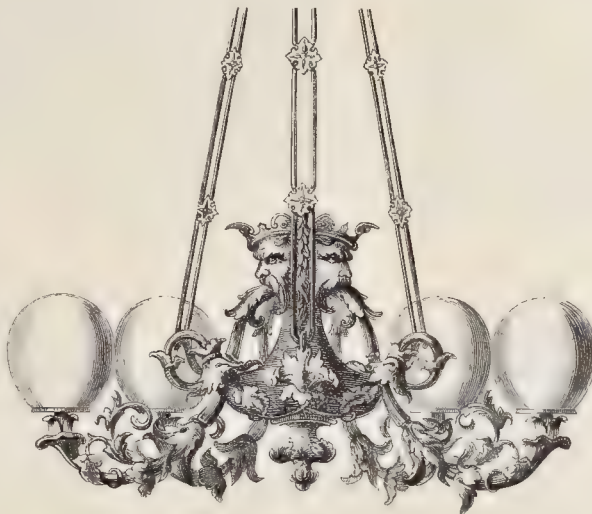


Fig. 169.



Fig. 171.



Fig. 172.

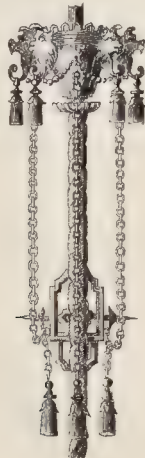


Fig. 173.

manufactures would require an extensive work. That large and important portion of them included under the general term of hardware (see note, p. 169) was favourably viewed by the Jury

produced of great beauty in design and excellence of workmanship, but adapted only to the resources of the wealthy. In order to produce such works in large quantities, and at a cheap rate, it was necessary

to substitute machinery for hand-labour, and this at once broke up the relation of the artist to the artificer, and tended for a time, at least, to injure artistic production. The objects first produced by the new method would be simple in form and as little ornamented as possible, in fact they would be mechanical rather than artistic. If the manufacturer found it necessary to employ an artist at all, the latter would find himself trammelled by the very method of production. In process of time, however, as the resources of manufacture improved, artists would endeavour so to vary and adjust their designs as to make them capable of being executed and multiplied by machine-labour. The mind of the artist would accommodate itself to the new circumstances of production more readily than the artisan: the former may furnish effective designs for casting in bronze and other metals, while the tendency on the part of the artisan to high finish would lead him to spoil the details of form or surface, as rendered by the mould, by injudicious chiselling, and other operations. So great was this evil found to be some years

ago in France, that a school was established for the purpose of instructing artificers in drawing and modelling, combined with the practice of chasing, chiselling, and finishing castings in metal. Such a plan as this not having been adopted in Great Britain until very recently, British hardware is, in point of taste, inferior to that of some other countries. But so vast are the commercial advantages reaped by this country from unornamented machine-made wares, that the deterioration of the ornamented sorts has ever been of little importance in a commercial sense, because counterbalanced in the estimation of the majority of purchasers by other qualities which are more easily appreciated. It is only within the last few years that the artistic element has begun to assert its claim, to meet which efforts have been, and are being constantly made, to adjust properly the mechanical and the artistic elements in manufacture.

In comparing the productions of this country with those of some of the continental states, it must not be forgotten that the industry of the United Kingdom owes its existence to private enterprise, and



Fig 173.

more artistic than workmanlike—"the artistic element hinders the development of the mechanical; precisely the reverse of the case in the United Kingdom, in which the mechanical overwhelms or over-spreads the artistic. In the one artistic skill is indigenous—mechanical for the most part exotic; in the other the reverse is generally true." Hence in France industry tends to emulate the national manufactures, and to produce a supply of expensive luxuries—a tendency injurious to the progress of useful industry; while in the United Kingdom the feeling for utility has tended to check the progress of taste. The progress towards free-trade which is now being made in France, and the freer intercourse with Great Britain, will tend to the development of the utilitarian principle; while in our own country the establishment of Schools of Design, and the encouragement given to native artists, show that our manufacturers are aware of the fact, that in order to maintain their position in the markets of the world, they must combine beauty of design with excellence of material and workmanship.

THE CERAMIC COURT.

A COURT devoted to the exhibition of specimens of pottery and porcelain has lately been opened in the Crystal Palace, and by the side of it is another Court for the exhibition of glass. These substances hold so high a rank in the manufacturing industry of Great Britain, that they may, not inappropriately, occupy our attention after our survey of the principal manufactures in metal. The specimens of ceramic ware which we now have to consider do not, however, illustrate the manufacture, but rather the history of the art; and even in this respect the collection, choice and beautiful as it is in many respects, fails for want of a proper arrangement of the specimens. Most of this costly fictile ware has been generously lent by its owners for the special purpose of edifying and amusing the numerous visitors to the Crystal Palace; and it would appear to be a matter of the greatest importance to place these specimens in a historical series, so that the mind might contemplate them without distraction. In this way alone can the excellent idea be carried out, which has led the Directors to collect materials for a complete

tional value, and illustrates the proud position which English Ceramics have now taken. It appears to have been generally admitted by those who examined the display of porcelain at the recent Exhibition at Paris, that English porcelain now stands unrivalled, with the solitary exception of that of Sèvres; but we must again repeat, that in order to a perfect representation of the progress we have made and are making, a classification such as that at Sèvres is highly necessary. Two or three years ago we had an opportunity, through the kindness of M. Regnault, the resident Director, of minutely examining the imperial manufactory and museum at Sèvres, and the large amount of pleasure and instruction which we derived was due quite as much to the scientific method and order which regulated the arrangement as to the intrinsic merit of the specimens themselves. Here we could trace the progress of fictile art, from the sun-baked clay vessels of the savage to the ceramic pictures of the accomplished modern artist; here we could study what may be called the *geography* of the art, from the

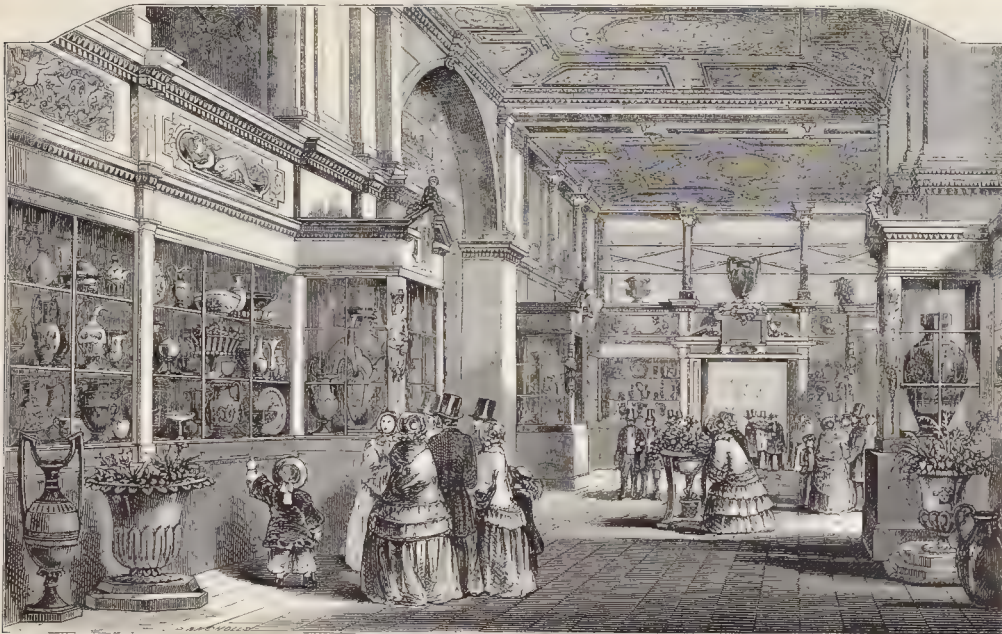


Fig. 174.—INTERIOR OF THE CERAMIC COURT.

educational system within the walls of this splendid building. From their own circular, we learn that "one of the chief objects originally advocated and proposed by the promoters of the Crystal Palace was, that it should include within its range the materials for an educational system unprecedented both for comprehensiveness and completeness; and that this should be developed in a form so simple and attractive, that its advantages might be generally and readily available for the instruction of the masses who, it was reasonably presumed, would be eagerly drawn to profit by its examination. The progress of a plan so vast in its scope, and so complex in detail, must necessarily be gradual, since its development involves not only a vast financial outlay, but requires the co-operation of men of eminence in the particular studies selected for illustration." The Ceramic Court is placed under the direction of Mr. Thomas Battam, who for many years superintended the art departments of the works of Mr. Alderman Copeland at Stoke-upon-Trent. The porcelain already collected has a high educa-

specimens contributed by the various nations of the world; and here too could be studied the *chronology* of the art, from the most distant periods to the present time. But invaluable as this collection is as a historical series, its value is still greater as a manufacturing one. The basis of this collection was of a heterogeneous kind, consisting of—*first*, a collection of Greek vases, made by Louis XVI. about 1785, to serve as models of form for the correction of the bad taste into which the modellers of his time had fallen; *secondly*, specimens of porcelain from the works of Meissen, Bawin, Brunswick, Wirttemberg, Vienna, &c.; *thirdly*, specimens of coarse pottery from various parts of France. In 1812 the director, M. Brongniart, determined to make the above specimens the basis of a scientific collection—an object which he caused to be made known as widely as possible, trusting to the known taste and generosity of educated men in all parts of the world to assist a scheme devised by a competent mind. Nor was he disappointed in this respect, for no less than seven-eighths of the whole collection were brought together

without purchase. The captains of the French navy, in returning from various parts of the globe, felt a lively interest in being able to contribute something to the national collection; and it was with very sincere pleasure that we noticed with what frequency the names of English manufacturers appeared as donors. One of the conditions of the collection was that every specimen, whether of raw produce or of finished ware, should have a label attached to it, containing concise but sufficient particulars respecting it, such as the name, the composition, the origin, the locality, the date, the use, &c., by which means articles of no value whatever without such information, become invested with a high degree of interest. The collection of raw materials is large and complete; the specimens are arranged in drawers, above which are the glass cases containing the finished articles. The raw materials are not classed according to their mineralogical or even technical characters, but with special reference to the manufacture to which they pertain. The progress of the art is further illustrated by a collection of tools, implements, trial-pieces, and other articles. We here notice the first piece of ware that was made with kaolin after its discovery at St. Yrieix, in 1765. There is also a collection of drawings and models of ovens, utensils, &c., in use in various parts of Europe. We were also particularly struck with a collection of *failures*, consisting of specimens illustrating the methods adopted to overcome faulty results, the whole properly arranged, with written records of the experiments undertaken, thus marking the progress of improvement, and anticipating retrogression, by showing what has been done, and what it is hopeless to attempt. The value of such a collection to the student and to the manufacturer, and hence, by a reflex action, to the public at large, is incalculable. Here, in the course of a few hours, the potter may gain a precise idea of his art, as practised at a former period in China, Germany, Great Britain, &c., and contrast it with the practice of his own day. Here he may contemplate the realisation of truths which are to him of little or no value in scientific books on chemistry, and are often costly and difficult to verify in his own works: such as the effects of the introduction of chromium on the manufacture of porcelain, of uranium on that of stained glass, &c.; but in a museum, under scientific guidance, he can examine the specimens at leisure, ask his own questions, and receive that precise kind of information which will enable him to judge as to the desirability of introducing the new process into his own manufacture.

Without pausing to inquire why there is not such an institution in Great Britain, let us now return to the Ceramic Court of the Crystal Palace. In viewing such a collection it must be borne in mind that so far as regards the finished products we are dealing with the Fine Arts rather than with the Useful Arts. People make collections of porcelain as they would collections of pictures, statuettes, or other articles which appeal to our sense of beauty by exquisite form, richness, variety and harmony of colour, choiceness of material, and, we fear, we must also add in many cases costliness, which limits the possession to the favoured few; oddness or eccentricity of design, which accords with the tone of some people's minds, love for the productions of a particular country, or period, or school, and other motives, such as fashion, &c. The close affinity between porcelain and pictures, between the fictile and the pictorial arts, may be seen in some of the enamelled works contributed to this collection by Lady Rolle, among which we would direct particular attention to an example of Dresden art—a slab, on which is represented a charming female figure, leaning forward in such a position as just to catch the rays of the setting sun streaming in through a window. The effect of this picture is perfectly delicious, exhibiting in full perfection that peculiar softness and creamy smoothness which belong to the best productions of this art. But it may be doubted whether this and several other subjects similarly treated,—such as the Virgin and Child, from the celebrated Raffaele in the Dresden Gallery; the Boys and Grapes, apparently from a Spanish picture; and large groups of flowers and landscapes,—are legitimate productions of this art, when presented on slabs to be exhibited by hanging against the wall. To produce such effects on canvas the artist lays on his colours as they are intended to appear, and trusts to the judicious criticism of time to soften, mellow, and blend them into a consistent whole. In working on porcelain, on the contrary, the metallic oxides, and other compounds destined to produce the desired results, are for the most part in their first application absolutely hideous as colours, bearing no resemblance to the ultimate effect after the work has been passed through the fire; so that the

artist has to work, so far as colour is concerned, literally in the dark, uncheered by the beauty and harmony which grow, as it were, out of the canvas of the oil-painter. And then again, after all his guessing and labour, the enamel-painter is at the mercy of the furnace; a few degrees of temperature too high or too low may ruin his work, or, as happened during our visit to the Royal Porcelain Works at Meissen, a beautiful work of Art may come out of the furnace cracked into several pieces, in consequence of some slight error in the cooling of the furnace. But it may be said that these objections apply to the highly-finished paintings on the various vessels and services to which they are usually applied. To some extent this objection is valid; custom alone has reconciled us to the incongruity of eating our food from off an elaborate picture—such, for example, as the plate in this collection, from the famous works of Minton, exhibited by Chamberlain and Co., of New Bond Street, on which is represented Mrs. Siddons, in the character of the Tragic Muse. No amount of argument would ever convince us that it is a fit, decorous, or becoming thing to soil with our food a highly-finished copy of one of Reynolds' finest works. The circumstance that such costly services are limited to the tables of the wealthy does not remove the objection: wealth and refinement are not always synonymous terms; if they were so, the inappropriateness in question would be keenly felt. The fact is, custom admits of these exquisite and laborious performances; but the plates and dishes are kept rather for show than for use, and, in spite of their homeliness of form, they hold equal rank with vases, figures, &c., where form is one of the chief elements of beauty. On such articles as vases it is fitting and proper to bestow a high degree of ornamentation. Flowers, wreaths, and the terminable magic of foliage, will not be out of place on them; figures of men and animals in relief may assist the original conception; and we should not object to a certain amount of landscape, and other pictorial features, as applied to an article whose chief object is to soothe and satisfy the mind with grace of form and beauty of surface decoration, associating as they do so well with the poetry of life. With such objects, however, as plates and dishes, cups and saucers, the ornamentation ought to be of a simple and subdued character. The objects themselves may be as graceful and elegant as a due regard to the proper use of the article will admit of; the material may, and, indeed, ought to be, of the purest and choicest kind; the glaze ought to carry out this idea of purity; the wreath of flowers or other simple ornamentation ought also to relieve, and not detract from, the leading idea of absolute cleanness and purity in the articles from which we take our food. Much gold, many opaque heavy colours, occupying most if not all of the surface, while opposing this leading idea, also suggest that of over-ornamentation, which is only another term for vulgarity. If it be said that dessert plates fall under a different rule, and that people while cracking their nuts may love to contemplate the beauty of the picture beneath, we still object that that is not the proper place for a picture—to say nothing of the unnatural position of a landscape placed horizontally; as if society had recognised these objections, it is the custom to cover the walls of the dining-room with pictures, so that during the pauses of conversation, and, indeed, as subjects for renewing it, the guests may refresh their minds by a contemplation of works of Art.

There is a well-marked distinction between pottery and porcelain, the one being opaque, and the other translucent. The term pottery appears to be derived from *potius*, a drinking-vessel, while the etymology of porcelain is rather uncertain. Some refer it to *porcellana*, the Portuguese for a drinking cup; others to the same word in Italian, signifying a univalve shell of the genus *cypræda*, or *cowries*, having a high-arched back, like that of a hog (*porco*, Ital.), and remarkable for a white smooth vitreous glossiness of surface.*

Pottery is further distinguished as being *soft* and *hard*, or, as the French call them, *tendre* and *dur*—terms which refer to the composition of the ware, and also to the temperature at which it is solidified: thus, ordinary bricks, common earthenware vessels—such as pipkins, pans, &c.—are *soft*; while fire-brick and crockery—such as Queen's ware, stone-ware, &c.—are *hard*.

The potter's art is almost as early as man on the earth; the most ancient record—i. e. the Book of Job—refers to it in a manner to

* We need scarcely refer to the fanciful derivation founded on the fact that the clay, or porcelain earth, improves in quality by being kept many years—the Chinese say a hundred years—whence the word *porcelain*, from *pour cent années*.

show that it was well-known; the potters of Samos are celebrated by Homer; and many specimens of pottery, belonging to the times of the Pharaohs have been found in Egyptian tombs. The religious employment of earthen vessels in early times has given the moderns much valuable information respecting the state of society at a former period: just as the fossil animals and plants have revealed to the geologist the condition of the earth in pre-Adamite times. It was formerly the custom to preserve the ashes of the dead in vases of baked earth; and even where this practice was not observed, earthen vessels have been found at the head and feet of the skeleton, or hanging on pegs along the sides of the tomb. In such vessels have been found medals, trophies, insignia, money, charms, rings, and votive offerings, all of which have a high historical value. On the monuments of Thebes the potter's art is represented pictorially: here we see the method of mixing the clay by kneading with the feet; the balling by hand, and throwing on a wheel of simple construction. The handles were afterwards attached as in the modern practice; the articles were placed on planks to dry; then arranged on trays, and carried to the oven; the ornamental designs being previously traced by means of a wooden or metal instrument. Sir Gardner Wilkinson has contributed to the Ceramic Court some specimens of Egyptian pottery, and also of Etruscan ware from Chiusi.

Although a general agreement in the nature and uses of ancient

sion, the Peruvians were in the habit of escaping from the towns, carrying with them much of their property, burying it, and then committing suicide.

But as the collection which we are now considering scarcely deals in ancient examples, we prefer to limit our remarks to the various schools of fictile art so beautifully illustrated in the Ceramic Court. This will exclude the earlier productions of Persia, Arabia, and Spain; but we shall have abundant material to fill our limited space by confining our historical remarks chiefly to the productions of Italy, France, and Germany, from the fifteenth century.

And first, with respect to soft pottery: the wares admit of four divisions—namely, *unglazed*, *lustrous*, *glazed*, and *enamelled*. The first three include the ancient pottery of Egypt, Greece, and Rome, as well as modern pottery, in common use among all nations. Enamelled ware is covered with a thick enamel or glass, composed of silica and oxide of tin or of lead, and capable of being ornamented with beautiful paintings.

The *majolica*, or enamelled ware of Italy, apparently dates from the twelfth century, and is of Moorish origin. A pirate king of Majorca was, about the year 1115, besieged in his stronghold by an armament fitted out at Pisa, and being completely routed, the expedition returned laden with spoil, among which were probably a number of plates of painted Moorish pottery, from the circumstance that such specimens have been found encrusted in the walls



Fig. 175.—COPIES OF ANCIENT ETRUSCAN VASES, CONTRIBUTED BY MESSRS. BATTAM AND SON

pottery is to be observed, there are still distinctive characters to be met with in the productions of different nations, thus imparting a high historical value to pottery. The individuality to which we refer may be noticed in the rude and simple urns of the early inhabitants of Great Britain; the more carefully fashioned specimens of the Roman period; the simple unglazed earthenware of ancient Greece; the more elaborate forms known as *Etruscan*, the finest specimens of which are attributed to the Greek potters of the Isle of Samos, already referred to; the red and black potteries of India; the black and white potteries of North America, in some cases interspersed with fragments of bivalve shells; the irregularly formed and fanciful pottery of South America, and many others. On the discovery of the extraordinary ruins of Central America, various specimens of pottery were found of a remarkably advanced kind for the period assigned to those ruins—namely, 1000 B.C. They had been formed, it is true, without the assistance of the turning lathe; but they are well baked, the ornaments are in different colours, and they are coated with a fine vitreous glaze, such as was unknown in Europe until within about ten centuries. In the Crystal Palace collection there are some curious specimens of the last-named description of pottery, lent by A. Anderson, Esq., who received them from an intelligent captain of a merchant vessel. These specimens were found in Peru, buried in the ground, with human skeletons, in a remote part of the country; and the theory is, that in consequence of the cruelty of the Spaniards during their inva-

of the most ancient churches of Pisa. Such specimens appear to have been long regarded as religious trophies, but no less than two centuries elapsed before any attempt was made to reproduce them in Italy. In the fourteenth century, however, specimens of *majolica* (so called from the island of Majorca) were produced similar to the Moorish examples, consisting of arabesque patterns in yellow and green upon a blue ground. About 1451 the manufacture had become celebrated at Pesaro. This place gave birth, in 1388, to Luca della Robbia, some of whose admirers, indeed, setting aside the above generally received account of the origin of *majolica*, assign the invention of this beautiful ware to him. He certainly appears to have worked with distinction as a sculptor in marble and in bronze, and to have abandoned that pursuit for modelling in terra-cotta; and he succeeded in making his productions therein durable by the invention of a white enamel, which enabled him to transmit his works to our own day, as may be seen by some interesting specimens in the Crystal Palace collection, contributed by W. Bryant, Esq. There is also in the centre of the Court the figure of a negro in a white dress, but this we suppose to be a copy. The chief productions of Luca della Robbia are *madonnas*, scripture subjects, figures, and architectural subjects. These Mr. Marryat *

* The reader interested in the subject will do well to study the work which Mr. Marryat modestly entitles, *Collections towards a History of Pottery, and Porcelain in the 15th, 16th, 17th, and 18th Centuries*. London, 1850. The greatest authority on the subject, chiefly of the manufacture, is Brongniart's *Traité des Arts Céramiques*, 2 vols., with an Atlas of Plates. Paris, 1844.

characterises as "by far the finest works of Art ever executed in pottery." "He adorned the Italian churches with tiles as well as with altar-pieces in terra-cotta enamelled; and he is the founder of a school which produced works not much inferior to his own." Another high authority refers in the following terms to the influence of the works of Luca della Robbia on the Ceramic art:—"Jeweller, sculptor, modeller in wax, he and his numerous family, devoted to the same profession, performed miracles with enamelled earth. Their most important works are in bas-relief, chiefly scriptural subjects, and principally in white earth and glaze. The specimens which have come down to us are as white as snow, and the glaze as perfect now as if they had been out of the furnace yesterday. Luca's earth has become marble, and having lasted till these days, continues to dazzle the world of taste by its brilliancy and lustre. His compositions are simple and sublime; generally the best modelled, and least liable to suspicion, are white on a blue ground."*

The manufacture of majolica, however, owes much of its celebrity and importance to the continued patronage, during two centuries, of the house of Urbino. The first duke, Frederick of Montefeltro (1444), took great interest in the manufacture, and his son established another work at Pesaro, in which the first artists of the age were employed. Succeeding dukes established other works, and used their efforts to improve the style of painting. The opinion that the great Raffaele was employed on some of these works has obtained for them the name of *Raffaele ware*. But as the finest specimens do not date earlier than 1540, or twenty years after the death of that great master, it is tolerably certain that he was not directly concerned in the manufacture. It is, however, admitted that some of his original drawings furnished his scholars with designs for some of the finest specimens. In the collection before us, *Raffaele's dish* will be studied with interest, together with the large collection of specimens of majolica, including the *lustrous*.

In the middle of the fifteenth century and at the beginning of the sixteenth many towns in Italy had become celebrated for their majolica ware, by which time the coarse specimens were named *mezza-majolica*, and the finer ware *porcelana*. From 1540 to 1560 the manufacture was at its greatest celebrity, under the patronage of Duke Guidobaldo II., first-rate artists being employed to furnish the designs. After the death of the duke, in 1574, the manufacture began to decline, and the introduction of oriental porcelain completed its ruin.

The best specimens of mezza-majolica are remarkable for the beauty and perfection of their colour and enamel glaze, the latter giving to the yellow and white the metallic lustre of gold and silver. The varying mother-of-pearl lustre is also remarkable, while the iridescent ruby, which Mr. Marryat says is peculiar to Pesaro and Gubbio, is rare. Blue and yellow, with their mixtures, appear to have been the only colours generally used in the painting, and they are used with striking effect. The general style of mezza-majolica consists of arabesques and heraldic devices round the rim of the dish, with a bust in the centre. The drawing is inferior to the colouring, until the introduction of the porcelain raised the art to excellence. About 1560 the designs became more fanciful and grotesque, and the colours inferior. But during the whole progress of the manufacture all kinds of articles were produced for common domestic use as well as for ornament. Pilgrims' bottles, recognised by the holes in the bottom rim for receiving the strap or cord by which the vessel was carried; vases of various forms, decorated with paintings, with handles in the form of serpents, and rims surmounted by grotesque figures of animals and fishes; fruit basins with embossed patterns in high relief; small plates for ices and sweetmeats; vases for holding different kinds of wine poured out from one spout; small flasks in the shapes of lemons and apples; cups covered with tendrils or quaint devices; small figures of saints; jocose figures; birds coloured after nature; painted tiles for walls and floors,—may indicate the extent and variety of the manufacture. But we must not forget to refer to the *amatorii*, or vessels adorned with the portrait and name of a lady, to be presented by

her lover. These are of great interest, as giving the costume of the period.

The painters on this ware were generally copyists, the designs being furnished by eminent artists, as already mentioned. Some of the original majolica painters, however, were sufficiently skilful to have preserved their names from oblivion, and the monograms attached to their works are known to collectors. The different towns had also their distinguishing marks; but the usual plan was to mark in blue characters on the back of the dish the subject of the design, but when a complete service was painted only the principal piece was marked: it was also usual to introduce the arms of the families for whom the service was prepared.

Majolica was introduced into Germany in 1507 by one Hirschvogel, of Nuremberg, but the manufacture does not appear to have survived his death. It was more prosperous in France, where, under the name of *faïence*, it took root under the patronising smiles of Catherine de Medicis, assisted by her kinsman, Louis Gonzaga, who established Italian artists in his dukedom of Nevers, and succeeded with native materials in producing enamelled pottery. By degrees, as native artists took the place of Italian ones, the classical designs of the latter yielded to French subjects, and at length descended to the production of common *faïence*. Nevers, however, recovered its reputation in the eighteenth century, and became celebrated for the brilliancy of the dark blue enamel with white patterns upon common ware. Rouen also invented a description of enamelled pottery, which attracted some notice; but the kind of ware which may be said to be peculiar to France is the *Palissy ware*, so named from Bernard Palissy, whose life reminds us that the Useful Arts have their romantic features as well as history and the Fine Arts. He was born at the commencement of the sixteenth century, of parents too poor to afford him any education; but the spirit which stirred within him taught him how to take advantage of scant opportunities, and he acquired the art of reading, writing, and land surveying, and earned his livelihood by the last-named pursuit. His natural love of the beautiful led him to study the works of the Italian masters, and he obtained employment in painting images and designs on glass. This enabled him to indulge his taste for travel, and for carrying on the work of self-tuition. He became master of the chemistry of his day, such as it was, and loved to study the forms and properties of minerals. In 1539 he settled at Saintes as an artist, married, and had a family. His attention was first directed to pottery by a beautiful enamelled cup; and on inquiring into the nature of the manufacture, he found that the composition of the enamel was kept secret by the manufacturers. He immediately undertook a course of experiments to discover the secret. He was unsuccessful; and we see him for some years with the persistence of genius in following up one leading idea, devoting all his time and means to this one pursuit, deaf to the entreaties of his wife, the cries of his children, and the remonstrances of his friends. He even borrowed money to enable him to construct a new furnace, and when too poor to buy fuel he burnt his furniture. Unable to maintain his assistant, or even to pay him his wages, he discharged him, and gave him his own clothes in lieu of money, becoming every day, if possible, more wretched than the preceding—avoiding wife, children, and friends, lest their reproaches should deter him from his purpose. Thus did Palissy work on for sixteen years, brave and heroic, as we call him, only because he ultimately succeeded, mad and criminal, had he failed. The accomplished artist at length became the successful potter; the court and the nobility smiled, and his beautiful patterns and *figulines*, or rustic pottery, became the fashion of the day. But though successful as a potter, he was a Protestant, while his powerful patrons were Roman Catholics. In 1562, under a new edict against the Protestants, his workshop was destroyed, and his life was only spared by the special intercession of the king, who claimed him as his own servant, and as such he was lodged in the Tuileries, where he escaped the Massacre of St. Bartholomew. In these evil days, however, the presence of an avowed Protestant was intolerable to the Leaguers, and he was arrested, and sent to the Bastille, where Henry III. visited him, and is reported to have said, "My good fellow, if you do not renounce your religious views I shall be constrained to leave you in the hands of my enemies." The old man is reported to have replied, "Sire, those who constrain you have no power over me, because I know how to die." Some authorities refer to him the additional declaration, that no power on earth should compel him to fall down and worship the images which he had made with his own hands.

* From a "Lecture delivered before the Literary and Scientific Society of Salisbury, January, 1853. London: printed for private circulation." This lecture was delivered by the late C. Baring Wall, Esq., M.P., and contains some valuable critical notices by one well qualified to give an opinion, and whose collection of porcelain, &c., which we have recently had an opportunity of examining at Norman Court, shows with what exquisite taste and diligence Mr. Wall had studied the subject to which his lecture refers.

With such a spirit we cannot wonder that the old man terminated his life in prison about 1589, at the age of ninety.

In the Ceramic Court there are some specimens of Palissy ware, contributed by B. Falcke, Esq., and W. Bryant, Esq. There is also some imitation Palissy ware contributed by Minton & Co. The style of this ware is quaint and singular, and is thus characterised by Mr. Marryat:—"The forms of his figures are generally chaste. His ornaments, his historical, mythological, and allegorical subjects, are in relief and coloured. The colours are generally bright, but not much varied, being confined generally to yellows, blues, and greys, though sometimes extending to green, violet, and brown. He never succeeded in attaining the purity of the white enamel of Luca della Robbia, or even that of the fayence of Nevers. The back of his pieces is never of a uniform colour, but is generally shaded or coloured with two or three different colours, such as blue, yellow, and brown. The enamel is hard, but the glaze is not so good as that of Delft. The natural objects which are placed upon this fayence are very true in form and colour; for with the exception of certain leaves, all were moulded from nature. The choice he has made shows that this potter was a skilful naturalist, for the fossil shells with which he has ornamented his different pieces are the tertiary shells of the Paris basin, and their species can be clearly recognised. The fish are those of the Seine; the reptiles and plants of the environs of Paris.* There is no foreign natural production to be seen on his ware." One peculiarity is that the dishes are loaded with objects in relief, forming what are called *pièces rustiques*, and intended for the adornment of the large sideboards of the dining-rooms of the period. Ewers and vases with grotesque ornaments, boars' heads, salt-cellars curiously formed, figures of saints, wall and floor tiles, exist in large numbers from the hand of this artist. One of his favourite subjects was a flat kind of basin or dish, representing, as it were, the bottom of the sea, covered with fishes, shells, sea-weeds, pebbles, snakes, &c.

Mr. Baring Wall, speaking of Palissy, says that, "although the hero of potters, and indeed a wonderful man, he added little by his writings to our knowledge of the Ceramic art. His ware consisted of coloured transparent glazes. His subjects were almost always in relief; generally of a subdued green, blue, or brown colour. He was a great master of the power and effect of neutral tints, but never rivalled, nor even approached, the pure white and polished glaze of Robbia."†

So early as the thirteenth century Germany appears to have attained celebrity for its enamelled ware—the discovery of a fine glaze being, of course, the secret of success. Ratisbon, Landshut, and Nuremberg, became formidable rivals of the Arabs and Italians. Mr. Marryat points out its distinctive character in the fine green glaze, the complicated form, the great number and variety of ornaments, lightness and good workmanship. Nuremberg was also famous for large enamelled tiles used for covering stoves.

Holland, from its exclusive connection with Japan, appears to have been stimulated at an early period, some say in the fifteenth, others in the sixteenth century, to imitate both in form and colour the Japanese porcelain. The principal seat of the manufacture was Delft, and its ware soon found favour on account of its fantastic design, excellence of colour, and beauty of enamel; the latter being smooth and even, and slightly tinged with blue. The Japanese parentage was evident in "the hideous imaginary animals of the Chimera class—the three-ringed bottle, the tall and shapeless beaker, and the large circular dish," which long held rank as favourite ornaments in Europe, while the more common articles were so generally distributed as to bestow on Delft the title of "parent of pottery." The introduction of fine English wares by Wedgwood and others, inflicted a permanent injury on the prosperity of Delft.

With regard to hard pottery, consisting of fine earthenware and stone-ware, named by the French *fayence fine* and *grès-cérame*, some of the earliest specimens, known to collectors under the name of *renaissance*, or fine fayence of Henry II., were probably manufactured in France during a short period, when, from some forgotten cause, the art became lost. Of this manufacture only thirty-seven pieces are extant, and as twenty-seven of them have been traced to Touraine and La Vendée, it has been supposed that the manufactory was at Thouars, in Touraine. The articles are made of a very fine

white pipeclay, not requiring a thick enamel, as in the case of a soft ware; but instead of concealing the fabric, it is made as apparent as possible by using only a thin, transparent, yellow varnish. As regards the style of decoration, the patterns are engraved on the paste, and the hollows filled up with coloured pastes, resembling the finest inlaying, or chiselled silver works in *niello*, whence this ware is sometimes styled *fayence à niellure*. There are also raised ornaments, such as masks, escutcheons, lizards, shells, garlands, &c., beautifully modelled; but the articles are mostly small and light, consisting of cups, ewers, and a vase with a spout for pouring, called a *biberon*. Some idea of the estimation in which these pieces are held may be gathered from the fact that six of them produced at a sale some time ago £190. A candlestick of this ware was purchased by Sir A. de Rothschild for £220.

It has been conjectured that the first manufactory of fine earthenware in England was established in the reign of Elizabeth at Stratford-le-Bow. Shakspeare's jug, which is still carefully preserved, is a good specimen of Elizabethan pottery. It is of cream-coloured earthenware, about nine inches in height, and sixteen in circumference in the largest part; somewhat of the shape of a modern coffee pot. It is divided lengthwise into eight compartments, each having a mythological subject in high relief, possessed of considerable merit. The silver top, or cover, is a modern addition, and contains a small medallion of Shakspeare, with the inscription, "William Shakspeare at the age of 40." Mr. Marryat characterises the Elizabethan pottery as being hard, approaching nearly to fine stone-ware, of a dingy white, and chiefly enriched with ornaments in relief of quaint figures and foliage. In the same reign we also hear of the Staffordshire potteries, the earliest specimens consisting of butter-pots of native brick earth, glazed with powdered lead ore, which was dusted on the vessel while in the green state. Also the *tig*, or drinking-cup with three handles, and the parting-cup, with two handles. In 1684, Mr. John Dwight established at Fulham a manufactory of earthenware, consisting of white gorges, or pitchers, marble porcelain vessels, statues, and figures, and fine stone gorges, and other articles—some of which are still valued by collectors, and may be examined in the Ceramic Court under the name of *Fulham ware*. Ale-jugs of native marl were introduced about the time of the Revolution, and were often ornamented with figures in white pipeclay. In the reigns of Anne and George I., an improved ware was made of sand and pipeclay, coloured with oxide of copper and manganese, forming the well-known *agate ware* and *tortoise-shell ware*, and giving to the pottery the character of hard paste, which was afterwards so greatly improved by Wedgwood under the name of *Queen's ware*.

The name of Wedgwood, made so familiar by being associated with his ware, is one of which the British nation has every reason to be proud. By dint of genius, perseverance, and integrity, this man succeeded in making his own fortune; which, however, is a very secondary consideration compared to the branch of national industry which he created, and which has continued ever since to flourish. There are many men like himself of lowly origin, self-taught and self-reliant, whose memory we still cherish as national benefactors. Arkwright and Smeaton, Brindley and Watt, and many others, will always be famous in English history for their conquests over nature and over themselves. Their example should ever be an encouragement to the artisan who is struggling to educate himself, seeing that in a country of free institutions no man is excluded from distinction on account of his birth, only as lowly birth may make the struggle more difficult, so will success be more honourable. Such, indeed, was the case with Josiah Wedgwood. He was the son of a potter at Burslem, in Staffordshire, but so inferior were the native productions that the higher classes obtained their porcelain from China, while the great bulk of earthenware for domestic use was procured from France, Germany, and Holland; indeed, the latter country had well-nigh supplanted us in the art of making tobacco-pipes, in which we had obtained some success.

Josiah's education scarcely deserves the name, since book-learning, about the time of his birth (1730), was not highly estimated by persons of his class. At the age of eleven we find him working in his brother's pottery as a thrower, and even this poor employment he was forced to give up in consequence of an attack of smallpox, which left him with a lame leg, and rendered amputation subsequently necessary. His first attempts to settle in life were not successful. He was partner for a short time

* This serves as one of the tests to discover the true Palissy ware; his imitations not having observed a similar rule.

† The reader interested in the subject is referred to Mr. Morley's interesting work entitled "Palissy the Potter."

with one Harrison, at Stoke, where he is said to have first conceived his love for the manufacture of ornamental pottery. He afterwards joined one Wheildon, and made knife-handles in imitation of agate and tortoise-shell, melon table-plates, green pickle-leaves, &c.; but he could not induce Wheildon to consent to undertake ornamental wares. In 1759 we find him again at Burslem, in a small manufactory of his own, where he must have been successful, for soon after he established a second factory, where he made a white stone-ware, and afterwards a third, where he produced his celebrated cream-coloured ware. He made an offering of some articles of this ware to Queen Charlotte, who was so pleased with it that she ordered a complete service, and this produced so much royal satisfaction, that Wedgwood was named the Queen's Potter, and his ware, "by command," the *Queen's ware*. Among Wedgwood's other inventions were—a *terra-cotta* which could be made to resemble porphyry, granite, &c.; *basalts*, or black ware, which would strike sparks like a flint; *white porcelain biscuit*, with properties similar to the basalt; *bamboo*, or cane-coloured biscuit; *jasper*, a white biscuit of exquisite delicacy and beauty, fit for cameos, portraits, &c.; and a *porcelain biscuit*, little inferior to

mistaken, as we think—that it was wrong to make a beautiful work of Art too common. But, believing with the poet that—

"A thing of beauty is a joy for ever,"

we would, if it were possible, convey the refining influence of this beautiful form far and wide, by placing it in the power of persons of moderate means to become possessed of a copy. Wedgwood charged fifty guineas for each of his fifty copies, and lost money, it is said, by the transaction. The reader will regard with interest one of these fifty copies in the Ceramic Court, together with other specimens of old Wedgwood ware from private collections, lent by Isaac Falcke, Esq. In another part of the Court is another collection of old Wedgwood ware, consisting of a set of Flaxman's chessmen, friezes, vases, broken columns, bas-reliefs, tea-service, &c., also from private collections. The name of Flaxman reminds us of another obligation which we owe to Wedgwood. With the true spirit of enlightenment, he introduced a higher class of artists than had hitherto been accustomed to work in the potteries—thus improving the public taste, stimulating Art, and encouraging other manufacturers to improve their wares. The extension of Wedg-



Fig 176.—SPECIMENS BY MINTON AND CO., EXHIBITED BY CHAMBERLAIN AND CO.

agate in hardness, and used for mortars in the laboratories of chemists. He also succeeded in giving to hard pottery the vivid colours and brilliant glaze which had been thought peculiar to porcelain.

About 1762 Wedgwood opened a warehouse in London, and committed it to the care of Mr. Bentley, a gentleman of distinguished literary and scientific tastes, who succeeded in enlisting the sympathies of many patrons of Art in favour of the rising Staffordshire works, and obtaining the loan of vases, cameos, specimens of oriental porcelain, specimens from Herculaneum, and other articles, to be copied and multiplied by processes and materials which Wedgwood had invented. About this time the celebrated Barberini Vase was offered for sale, and with a view of producing facsimiles of it, Wedgwood determined to become the purchaser, and, at the time of sale, found himself bidding against the celebrated Duchess of Portland. Happening in the course of the bidding to mention his object in becoming its possessor, her grace offered, if he would withdraw his biddings, to lend him the vase. This was accordingly done, and the Portland Vase, as it was henceforth called, was purchased for 1800 guineas. Wedgwood executed fifty copies of the vase, and then destroyed the mould, under the idea—

wood's works, and the numerous people to whom they gave employment, led to the foundation of a new village near Newcastle-under-Lyne, to which he gave the name of *Etruria*, in consequence of the resemblance of the clay dug there to the ancient Etrurian earth, and also, probably, to celebrate the success with which he imitated the ancient Etruscan ware. So celebrated did this village become that it was long a point of attraction throughout Europe; we may even, at the present day, find traces of this celebrity in the various collections on the Continent—his cameos, and other works of Art, taking their place among the choice specimens of Dresden and Sévres. We must not forget to mention in this slight sketch that the patronage by which Wedgwood had so largely benefited he freely extended to others; some of the most brilliant of Priestley's discoveries were helped forward by the friendly aid of Wedgwood, while he himself was a contributor of several papers to the transactions of the Royal Society, of which he was a fellow. He died at his mansion in Etruria, in 1795, in his sixty-fifth year.

The Ceramic Court contains various specimens of stone-ware, both common and fine, the latter only differing from the former in the superior composition of its paste. The Chinese have long been celebrated for this kind of ware, and in large works use it as the

basis for a surface of porcelain paste, examples of which may be seen in this collection, together with the stone pottery of the Rhine of the sixteenth century, remarkable for quaintness of form, richness of ornament, and for the colour of its enamel. Flemish stone-ware, or *grès Flamand*, is remarkable for its beautiful blue colour, quaint forms, and rich ornaments, and belongs to a period between 1540 and 1620. France also appears to have produced stone-ware previous to the sixteenth century. England appears to have employed Dutch and German workmen in its manufacture at an early period. In 1690, the method of glazing by means of common salt caused the stone-ware to displace Delft and soft paste fabrics. The red Japan ware (which is a very fine unglazed stone-ware, with raised ornaments) was made in England towards the end of the seventeenth century, after many attempts to imitate it by Dutch and English manufacturers. And here we have another of those romances which throw such a charm over the history of the Useful Arts. Two brothers, named Elers, from Nuremberg, discovered at Bradwell, about two miles from Burslem, a bed of fine

than the other, requiring a higher temperature for its fusion, and having a greater density: the soft is moreover distinguished as being easily scratched by a steel point.

The most ancient descriptions of porcelain are those of China, Japan, and Persia. The Chinese manufactured porcelain at an early period: in the tombs of Thebes, bottles of Chinese manufacture have been found; and from an inscription upon one of them it would appear to have been manufactured between 1575 B.C. and 1289 B.C. These bottles, however, are of inferior workmanship. Porcelain appears to have been common in the empire in the year 163 B.C., but to have attained its greatest perfection in 1000 A.D. The porcelain tower near Nankin was constructed in 1277, and well illustrates the durable nature of the material; for it is said perfectly to have resisted the action of the weather during the long period of its existence. Marco Polo describes the manufacture in China during the thirteenth century, and specimens of the ware gradually found their way into Europe; but it was not until the Cape of Good Hope had been doubled by the Portuguese that these fine wares



Fig. 177.—FROM THE SHAKSPEARE SERVICE OF MESSRS. KERR AND MINNS.

red clay, which they worked at a small factory, situate on the bed itself. They did their best to conceal their discovery, as well as the processes by which they executed their ware, which Mr. Marryat characterises as being fine in material, and sharp in execution, the ornaments being formed in copper moulds. They even employed the most ignorant and idiotic workmen that they could meet with; but no sooner did the ware become celebrated, than a potter named Astbury counterfeited idiotry, and engaged himself as the servant of the two brothers. He even continued in their service for some years, until he had completely mastered all their methods, and made drawings of their apparatus, &c. He then set up a factory for himself; and others soon following his example, the foreigners could not resist the force of competition, and they closed their establishment in 1720, and found a more congenial home in the porcelain manufactory at Chelsea. From this period the history of fine English stone-ware is connected with the name of Wedgwood, whose history we have already sketched.

In proceeding to notice the specimens of porcelain in this collection it will be borne in mind that there are two kinds, distinguished as *hard* and *soft*, the one containing more alumina and less silica

became generally known. The Portuguese, struck by the resemblance of this ware to the cowrie-shells named *porcellana*, imagined that the ware might be made of such shells, or of a composition resembling them, and named it accordingly. They imported into Europe splendid collections of the ware, which was also called, from the country of its birth, *China metal* or *earth*, with which majolica, exported sometimes by way of Venice, appears sometimes to have been confounded. On the expulsion of the Portuguese, the Dutch succeeded in establishing an intercourse with India and Japan, and they imported into Europe large quantities of porcelain. The English obtained their share in the ware later, through the medium of the East India Company; and the passion for collecting China appears to have taken root about the middle of the seventeenth century. In the time of Queen Anne services of oriental porcelain were common among the wealthy. The writers of the period make frequent allusions to it. Addison describes the passion in terms which cannot even now be said to be obsolete:—"There is no inclination in woman that more surprises me than this passion for china. When a woman is visited with it, it generally takes possession of her for life. China vessels are playthings for women of all ages.

An old lady of fourscore shall be as busy in cleaning an Indian mandarin as her great granddaughter is in dressing her baby." The French, who succeeded in establishing missions in China, have from time to time thrown considerable light on the manufacture. It appears that pure white porcelain is made at Fokien, and some of the most valued descriptions consist of small cups, and similar articles, with ancient inscriptions, devices, &c., upon them, under the glaze, so that they can only be seen by holding the article against a strong light. The blue and white porcelain ranks next in antiquity, and is produced at Nankin, where also is produced the pale buff on the necks of bottles and backs of plates. King-te-tching is said to be the parent of the old sea-green and crackle porcelain, known by the name of *celadom*—the term *crackle* being applied to those specimens in which the glaze appears to be cracked all over into small fissures. The brilliancy of this porcelain is said to be unequalled in Europe. The very thin transparent ware, resembling an egg-shell in appearance, and bearing the name of "egg-shell porcelain," marks the perfection of the art. The most esteemed colours are yellow and ruby—the yellow being the only colour used at the imperial table, and the ruby found only on the reverse of the finest plates and small pieces. There is a brown porcelain, white inside, and with white medallions outside, in common domestic use in China; and there is an inferior and more modern porcelain, known as *Indian china*, manufactured at Canton. But in all cases, whatever may be the beauty of the material, the delicacy of texture, the brilliancy of colour, and the purity of the glaze, the form and the design are always repulsive to good taste. The vase of the humblest Greek potter of the best period has an æsthetic value far above the most costly productions of the celestial empire. The collection at the Crystal Palace contains a specimen of Turquoise Celadom from the Duke of Devonshire's collection; an Indian vase from D. Falcke's collection; some specimens of egg-shell; an oriental vase, enamelled on copper; and other examples of Chinese and Persian ware. The most celebrated collection of oriental porcelain in Europe is in the Japanese Palace at Dresden. It occupies thirteen rooms, and contains specimens of enormous size and monstrous form.

Mr. Marryat distinguishes the porcelain of Japan, as compared with that of China, in the following terms:—"It is of a more brilliant white, and the clay is of a better quality; the designs are more simple, and the decorations less overloaded; the dragons are not so monstrous; and the flowers are designed more in accordance to nature. The glazing also is more tinged with blue, and more delicate: it does not stand the heat of the fire so well as the Chinese. Some degree of taste is shown in the forms, which are more natural than the Chinese. Chinese and Japan ornaments are, however, sometimes found upon the same pieces; and the Chinese occasionally imitate the Japan porcelain."

During two centuries after the introduction of Chinese porcelain into Europe attempts were made to imitate it, but in vain; and in recording the first successful attempt we shall again appear to be dealing rather with the romance than with the reality of Art. An apothecary at Berlin had an assistant, named John Frederick Böttcher, who, being fond of chemical pursuits, had no difficulty in exciting the suspicions of the authorities that he was dealing in the black art. To escape persecution, he fled to Dresden, and claimed protection of the Elector of Saxony, Augustus II., who eagerly inquired of him respecting the art of transmuting the baser metals into gold. Böttcher, more honest or more incredulous than many of his brother alchemists, frankly confessed his ignorance, but was disbelieved, and was placed under the strict tutelage of Tschirnhaus, who was endeavouring to discover the art of converting old age into youth by means of the *elixir vite*. Böttcher was set to work to discover the philosopher's stone; and in the course of his experiments he made some crucibles, which, on being passed through the furnace, assumed many of the characters of oriental porcelain. The ware was, however, of a red colour, and was prepared from a brown clay found near Meissen. The elector saw at once the importance of the discovery, and, in order that he might pursue his experiments in secret, sent him to the Castle of Albrechtsburg, at Meissen, where he was royally provided for, but kept, nevertheless, under surveillance, lest he should escape with his important secret. During the troubles consequent on the invasion of Saxony by Charles XII. of Sweden, Böttcher, Tschirnhaus, and three workmen, were kept in safety in the fortress of Königstein, on the Elbe, above Dresden, where a laboratory was prepared. Böttcher's fellow-prisoners

formed a plan of escape, in which Böttcher refused to join, and even communicated it to the commandant, whereby he succeeded in obtaining a larger amount of liberty. In 1707 he returned to Dresden, and continued to work with his colleague, inspiring all around him with cheerfulness by his gay and lively disposition, during some of the furnace operations, which lasted two or three days, without quitting his post. In 1708 Tschirnhaus died, but Böttcher continued his experiments on a more extended scale, and with success. In his enlarged furnace he extended the period of the firing to five days and five nights. The king was present at the opening, and was delighted with the progress made. Still, however, the produce was only a species of red and white stone-ware; and when at length, in 1709, a white porcelain was produced, it bent and cracked in the fire. Sufficient progress had been made to encourage Augustus to establish the manufactory at Meissen, of which Böttcher was appointed director. Here he succeeded, in 1715, in producing a beautiful porcelain, by means of the kaolin of Aue, in the Erzgebirge, the discovery of which was due to one Schnorr, an iron-master of the district. He observed, when riding near the place, that his horse's feet stuck in a soft white tenacious earth. It occurred to him that this earth might make a good substitute for hair-powder, which was then in general use, and he manufactured it in considerable quantities, and sold it at Dresden and elsewhere. Böttcher was one of those who adopted the new hair-powder, and, with the acute observation of a man of genius, he soon remarked that it was much heavier than the ordinary powder made of wheat flour. Having ascertained from his valet that it was a mineral, he immediately tried it in his furnace experiments, and was surprised and delighted to find that he had at length discovered the material for making white porcelain. But the secret thus curiously gained was for a time carefully preserved. They continued to call the powder by its commercial name of Schnorr's White Earth (*Schnorr'sche weisse Erde*), its exportation was forbidden, and it was introduced into the factory in sealed barrels, by persons who were sworn to secrecy. A similar obligation was imposed upon all persons concerned in the factory; visitors were carefully excluded; and the factory was managed more like a besieged fortress than a peaceful residence. In each room the motto in large letters was written, "Be secret until death;" each workman, from the inspector downwards, was sworn to secrecy once a month, and when the king took any person of distinction to see the works he imposed a similar oath on the visitor.

With so much care to conceal materials and processes, it is not to be wondered at that some of the workmen should listen to the voice of the tempter, seeing that it was now an object of royal ambition throughout Europe to manufacture porcelain. Even before Böttcher's death, which took place in 1719, at the early age of thirty-seven, a foreman escaped from the factory, and proceeded to Vienna, where he sold the secret, and rival establishments soon rose up in different parts of Germany. But the real or supposed superiority of Dresden china caused this exclusive system to be kept up until modern times. By degrees, however, as the porcelain of other countries attained celebrity, visitors were admitted on payment of an entrance fee. The writer visited the works at Meissen a few years ago: they still retain the old castellated appearance, and stand out picturesquely on the banks of the Elbe. The various workshops are light and airy (the principal one being ornamented with a bust of Böttcher), and some of them look out upon the river. There is of course nothing peculiar in the mode of working; and here, as at Sévres, we were struck with the lassitude which seemed to pervade the whole establishment. No one seemed to be in earnest; work appeared to be slack, and the labourers few—a consequence doubtless of state support and royal patronage, and bearing about the same relation to such works as Minton's as the humble-bee's nest does to the busy swarming hive.

The early productions of the Meissen works were, for the most part, imitations of oriental patterns, with a want of grace and lightness. There was, however, a manifest improvement when a professional sculptor, Kändler, had the direction of the modelling. His garlands, bouquets, animals, groups, chandeliers, and vases, are much admired. After the Seven Years' War, which stopped the works, Meissen became celebrated for its exquisite miniature copies of the best Flemish pictures, birds, insects, flowers, animals, &c., which were painted by Linderer, and other first-rate artists. When Frederick of Prussia attacked Dresden in 1745, vast quantities of porcelain became the spoil of the conqueror, who also forcibly carried

off to Berlin some of the best workmen, together with models and moulds. That a king should desire to become a porcelain manufacturer at the time to which we refer need not excite surprise, seeing that Meissen sold wares to the annual value of from 150,000 to 200,000 crowns, while the annual expense was not estimated above 80,000 crowns; besides the fashion of the thing, which caused magnificent presents in porcelain to be so highly appreciated. Moreover, a king like Frederick, who was so fond of indulging in the expensive luxury of war, would be glad to avail himself of so profitable a source of income.

The finest specimens of Dresden china were made previously to the Seven Years' War. Mr. Marryat characterises it as being superior in form to that of any other manufacture—it being for the most part taken from the classical models of the ancients, with which it vies in elegance and beauty. "The groups from antique models, the lace figures—so-called from the fineness of the lace-work introduced in the dress, the flowers true to nature, the vases richly adorned and encrusted, called *honeycomb*, are all unequalled in beauty of execution, and show the great excellence of the artists employed."

The various rival establishments which were started in different parts of Germany had the effect of converting the establishment at Meissen from a source of revenue to a source of expense, and the works are now no longer a royal toy, but are managed by the finance department. They yield some little profit, but their glory has departed. The articles produced are of inferior quality and material, the beds of fine clay in the neighbourhood being well-nigh exhausted. The Ceramic Court contains various specimens of Dresden porcelain from the collections of Lady Molesworth, the Duke of Devonshire, and D. Falcke, Esq.—the latter gentleman contributing numerous and highly interesting specimens, which the visitor will do well to examine. There are some curious specimens of basket-ware, resembling large wicker baskets, with numerous handles, and small wicker doors opening at the side, and moving on hinges. A certain ideal finish is given the figure by resting it, as it were, upon a bed of flags, whose lanceolated foliage rises up gracefully, and constitutes, indeed, the only pleasing part of the production, affording as it does a refreshing glimpse of nature amidst the embarrassments of Art. Those only who are acquainted with the practical details of this manufacture can be at all aware of the enormous difficulties of forming one of these baskets, and passing it successfully through the furnace; and when the results have been successful, as in the cases before us, we have an infringement of one of the soundest canons of Art—namely, not to imitate an inferior material in a superior.

By the side of a pair of pheasants, executed at Dresden when Marcoline was the director (1796), lent by H. Porter, Esq., are some specimens of the porcelain of Vienna, the first rival of Meissen, originating in 1720, as already noticed, by the defection of a foreman from Meissen. The factory, however, does not appear to have flourished until the time of Maria Theresa, 1744, and the Emperor Joseph, when it became one of the most prosperous establishments of the kind in Europe. Vienna porcelain is not equal to that of Dresden or of Berlin; it is thicker than the Dresden, and the glazing inclines rather to grey. It is chiefly remarkable for the fineness and taste of its raised and gilded work, and, of late years, for the application in relief of solid platinum and gold. The largest sale of this ware was in Turkey; and now that the works are in private hands, large quantities are exported to Italy, Russia, and Turkey.

The manufacture of porcelain was successfully introduced into a celebrated pottery at Höchst, on the Nidda, in the territory of Mayence, in 1740, in consequence of one of the Viennese workmen offering to superintend the production. This man, Ringley by name, had committed the various processes of the Vienna establishment to writing, and carefully concealed his manuscript about his person, giving out the materials to the people under him, and apportioning them according to his written recipes. Such a state of things was not likely to last. Some of the workmen took advantage of Ringley's fondness for wine to make him drunk, and in his helpless condition obtained possession of his papers, which they carefully copied. They then decamped, and sold their secrets to persons in different parts of Germany who were anxious to fabricate the precious ware. From the same source originated the manufactories of Switzerland, of the lower Rhine, of Cassel, and even of Berlin. The Fürstenburg works, in the Duchy of Brunswick, originated in the offer made by

one of its dukes to one of the Höchst workmen. The works at Frankenthal, in Bavaria, originated in a pottery which was visited by Ringley after he had been robbed of his papers; and on the death of the owner the establishment was purchased by the Elector Palatine. During the French Revolution the factory declined, and in 1800 it passed into private hands, in which it still continues. To Ringley is also due the establishment of the works at Nymphenburg, in Bavaria, a few miles from Munich. Some specimens from these works are contributed to the Ceramic Court from Lady Molesworth's collection. This porcelain is much esteemed, the celebrated picture gallery at Munich furnishing many of the designs. A manufactory at Baden was carried on until 1778 by some of the Höchst workmen. The factory of Ludwigsburg was established in 1758, under the patronage of the Duke of Wirtemberg, and produced some beautiful works, which are also known as *Cronenburg porcelain*, from the town of that name, and the mark of C. C. on its ware; but it was a losing concern, on account of the distance from which the clay and the fuel had to be carried. The porcelain manufactory of Berlin originated with some of the workmen who obtained possession of Ringley's papers, as already noticed, but it does not appear to have been successful until Frederick the Great adopted the violent means of transferring to it the best of the artists and of the plant from Meissen. The Berlin porcelain was of course in the style of the Dresden, and soon came into such request that the factory yielded the king an annual revenue of 200,000 crowns. In 1790 a second royal manufactory was established, two miles from Berlin. Since 1827, porcelain tablets, called *lithophanes*, or transparent pictures, in white porcelain have been manufactured. They are cast in a mould from a wax model; the various thicknesses of the tablet giving the effect of light and shade; and when held up to the light they have the appearance of being painted in *grisaille*. The Ceramic Court contains specimens of Berlin ware. Cassel appears to have given its name to porcelain; and a work is said to have been established at Fulda, about 1763, in consequence of the disclosures of one of Ringley's workmen. Another factory was established by the Prince-bishop of Fulda, in a building adjoining the episcopal palace; but it failed, it is said, from the dignitaries of the church and their numerous relatives claiming the privilege of taking out of the factory whatever articles they chose without paying for them. The porcelain manufactories of Thuringia originated in the circumstance that about 1758 an old woman took some sand for sale to the house of the chemist Macheleid, whose son, struck with its appearance, made some experiments with it, and obtained a substance nearly resembling porcelain. Further inquiries justified the excellence of the material, and the Prince of Schwartzburg gave permission for the establishment of a manufactory at Sitzrode, which was afterwards removed to Volkstadt. The plentiful supply of fuel in the Thuringian forest led to the formation of other establishments, such as Wallendorf, in Saxe Cobourg, Limbach, in Saxe Meiningen, the director of which was so successful that he purchased the factory at Grosbreitenbach, in Rudolstadt, and also that of Kloster Veilsdorf. There was also a factory founded at Gotha, in 1780, at Hildburghaus, at Anspach, at Ilmenau, at Breitenbach, and at Gera. Some of these factories have degenerated into pottery establishments, and some of them make pipe-bowls; but the porcelain produced at these establishments during their respective seasons of prosperity is still sought for by collectors who know how to distinguish its leading characteristics and peculiar marks.

During all this busy emulation among the porcelain sovereignties of Europe, it is not to be supposed that Russia should look idly on. Several attempts were made to obtain the secret of the manufacture; and Elizabeth founded, in 1756, a factory near St. Petersburg, which continues to the present day to make good porcelain from native materials. The government of Denmark has a factory at Copenhagen, which does not pay its expenses. The factory at Zurich, in Switzerland, owes its origin to one of Ringley's workmen. Nyons, in the Canton de Vaud, was also at one time celebrated for its porcelain—specimens of which, together with that of Zurich, may be seen in the Ceramic Court.

The first English porcelain works were those of Bow and of Chelsea. They produced soft porcelain from a mixture of white clay and fine white sand from Alum Bay, in the Isle of Wight, with a sufficient quantity of pounded glass to improve its translucency. It is uncertain at what time the Chelsea factory was established, but it is probable that the introduction of oriental porcelain, about 1631, stimulated ingenious men to imitate it. The

factory does not, however, appear to have flourished until the accession of the house of Hanover, when George II., in imitation of other German potentates, patronised porcelain, and threw new blood into the Chelsea works by importing workmen, models, and materials from Brunswick and Saxony. Chelsea porcelain thus became the fashion, and such was the competition for it that it was sold by auction, the dealers thronging the doors of the factory to compete for a set as soon as it was out of the ovens. Some of the best productions were made between 1750 and 1765, and are of the style of the best German, the colours being fine and vivid, while the claret colour is said to be peculiar to this ware. Lady Molesworth has contributed some valuable specimens of Chelsea porcelain to the Ceramic Court, representing the Seasons, the Grecian Daughter, &c. There are also specimens from Lady Rolle's collection. The Bow china, made at Stratford-le-Bow, bears some resemblance to the Chelsea, but the material is inferior. It produced chiefly tea and dessert sets; and on the handle or under the spout of the cream-jug the letter B was either embossed or painted.

The works at Derby were established in 1750, and were subse-

King's Blue which this country could boast of was produced at Derby, and has been successfully imitated by Messrs. Rose and Minton.

The porcelain works at Worcester were founded in 1751 by Dr. Wall, and some other persons, under the title of the Worcester Porcelain Company. Dr. Wall appears first to have conceived the idea of ornamenting the ware, by transferring printed patterns to it while in the state of biscuit, a plan which is now in common use. The first efforts of the company were directed chiefly to the production of blue and white ware, in imitation of the blue and white Nankin. They afterwards imitated the Sèvres style, and the Dresden method of painting. The Worcester works are celebrated as being the first to make use of the kaolin discovered in Cornwall by Cookworthy, in 1768. The works are now carried on by Messrs. Kerr and Binns, who have contributed largely to the Ceramic Court. We would call attention to their Shakspeare services, Fig. 177, and to the duplicate of a plate, executed for her majesty in Worcester enamel, containing light classical figures and groups on a deep blue ground. We see also by some specimens lent by



Fig. 178.—SPECIMENS OF LIMOGES, SÈVRES, DRESDEN, BERLIN, AND VIENNA PORCELAIN.

quently improved by the introduction of many of the artists, workmen, and models from Chelsea. Mr. Marryat characterises the Derby porcelain as being very transparent, of fine quality, and distinguished by a beautiful bright blue, often introduced on the border or edge of the tea-services, the ground being usually plain. The white biscuit figures rival those of Sèvres.

Mr. Baring Wall characterises the Chelsea of all English china as the most attractive, with its peculiar claret colour, its bold designs, its quaint devices, unimitated, because inimitable. The advantages of Chelsea over other workshops were the possession of a clay, not so tender as the old Sèvres, but softer than any other we possessed; it had French moulds and models, and French workmen, conversant with the secrets of the art. At a later period it formed a junction with the Derby fabric, and the anchor and the letter D, the monograms of each manufacture, became identified; the same models were used by both establishments, and Flaxman furnished designs. The union was not of long continuance; the partners quarrelled, and one of them melted down the models. The best

J. J. Rogers, Esq., of what the works were capable in the year 1780 these consist of part of a dessert-service of that date.

A porcelain factory was founded in 1772 at Caughley, near Broseley, Colebrook Dale, the productions of which are known as *Salopian ware*. At the beginning of the present century some good porcelain was made at Nantgarow and Swansea; and, according to some authorities, the *Bristol china*—a name given to a white ware, at one time not uncommon in the west of England—was made in Wales, and sold in Bristol. Specimens of Bristol porcelain are to be found in the Ceramic Court. The works of recent or existing manufacturers are also, to a certain extent, illustrated there. Among these Minton and Co. are conspicuous. Their tea-services, beautiful and delicate in form, exquisite in device, and rich in colour, contrasting with their porcelain vases, flower vases, and enormous majolica vases, would seem to illustrate the beautiful and the sublime in the fictile art. We have also some exquisite busts manufactured by Copeland from porcelain earth, such as the bust of Clytie, reduced from the original in the British Museum—a form of the art which cannot be too highly commended, since there is nothing more touching to the thoughtful

mind than to be brought face to face with the worthies and celebrities of the past, and we cannot but regard the splendid collection of busts in the Crystal Palace as one of its most attractive features; and were a better system of classification adopted, its interest would be greatly increased. If all the warriors were collected into one class, all the poets into another, the historians into a third, the artists into a fourth, the musicians into a fifth, and these classes again properly subdivided, how deeply interesting would be the study of the features of men whose reputation belongs rather to the world than to their own country. But scattered as these valuable casts are throughout the building, they bewilder and confuse where they should instruct and delight; and they even sometimes, by their odd juxtaposition, excite amusement or disgust—for it was only at our last visit that the stately colossal head, massive and dignified, of Goethe had for its companion the bewhiskered face of a popular orator of the present day, reminding one of Landseer's picture of "Dignity and Impudence." But to return to the Ceramic Court. We refer with peculiar pleasure to what are called "reproductions of Greek vases, chiefly copies of those in the British Museum," manufactured by Messrs. Battam and Son. There is also an Alhambresque vase by Copeland, and some specimens of Spode's terra-cotta, bearing date 1800, and some specimens of *jasper ware*, to which the same well-known name is attached.

The part which France has taken in the manufacture of porcelain deserves a far more extended notice than our limits will allow. This highly-imaginative and intellectual nation has ever regarded with impatience the successful progress of any Art-manufacture in other lands. With exquisite taste, a profound knowledge of the scientific principles on which every manufacture rests, with great energy and perseverance, France only wants the raw material, the capital, and, we may add, the free institutions of Britain, to prove a formidable rival in the markets of the world. The want of the proper raw material in the case of porcelain prevented France, during the long period of sixty years, from surpassing the choicest productions of Dresden. As early as the year 1693 a soft porcelain had been manufactured at St. Cloud, and some of the most distinguished scientific men of France endeavoured, under royal patronage, to discover the secrets of the art; and partly by this means, and partly by bribery, they so far succeeded that the company who had the management of the works removed from Vincennes, where the crown had given them buildings, to a large edifice which they had constructed at Sèvres. This was in 1756. They do not, however, appear to have been very successful; for in 1760 Louis XV. bought the whole establishment, being probably incited thereto by Madame de Pompadour, who shared with other fine ladies of her time in the passion for porcelain. The soft porcelain or *pâte-tendre*, as the French called it, was carried to the highest pitch of excellence; but the ambition of every one concerned in the factory was to produce the hard porcelain for which Saxony was so famous. The want of kaolin was the fatal defect; and it was not known to exist in France until about the year 1768, when the wife of a poor surgeon, named Darnet, residing at St. Yrieix, near Limoges, having noticed in a ravine near the town a white unctuous earth, fancied, poor soul, that she might favour the economy of her household by using it instead of soap. She informed her husband of her discovery, and of its proposed application, and he showed it to an apothecary at Bordeaux, who having heard of the researches that were being conducted for porcelain earth, forwarded a sample thereof to the chemist Macquer, who was delighted to recognise in it the much-desired kaolin. Having satisfied himself that the material could be had in abundance, he organised at Sèvres the manufacture of hard porcelain in 1769. There was some difficulty at first in managing the colours upon the more compact and less absorbent materials, so that the soft porcelain continued to be manufactured until 1804. "This soft porcelain was remarkable," says Mr. Marryat, "for its creamy and pearly softness of colour, the beauty of its painting, and its depth of glaze." That for common or domestic use generally had a plain ground, painted with flowers in patterns or medallions; articles of *luxe*, and pieces intended for royal use, generally had grounds of various colours—such as *bleu de roi*, *bleu turquois*, *jaune* or yellow, *vert-prés*, and the lovely *rose Dubarry*. The best artists were employed on the highest class of porcelain—on landscapes, flowers, birds, boys, and cupids, gracefully disposed in medallions; some of the subjects being after Watteau. The jewelled cups of the best period, with the *bleu de roi* ground, are very celebrated. The tests by which Mr. Marryat

determines the value of the Sèvres porcelain constitute its highest eulogium—namely, "the beauty of the painting, the richness of the gilding, and the depth of colour." As regards beauty of form, the Sèvres china is stiff and inelegant compared with that of Dresden. By a law passed in 1766, and renewed in 1784, all manufactures of porcelain in France, except the royal one of Sèvres, were prohibited from using gold in their decorations.

As the genuine soft porcelain of Sèvres of the best period—i.e. from 1740 to 1769—is difficult to procure, while the secret of its production appears to have been lost, unscrupulous dealers have



Fig. 179.—JEWELLED PORCELAIN OF SÈVRES.

resorted to a curious fraud for the purpose of supplying the demand. At the commencement of the peace of 1815 the old stocks of porcelain at Sèvres were sold by auction, and they were industriously bought up by certain persons, who obtained as much as they could from private collections also. It must be understood that none of these specimens were distinguished by those much-desired colours, the *bleu de roi*, the *turquoise*, and the *rose Dubarry*; and the object of the purchasers was to impart these colours, together with certain designs in imitation of the best porcelain of the best period. This was done by filing off the original pattern and glaze, colouring the ground with one of the three colours mentioned,—turquoise answering the best,—and adding medallions and other paintings. On passing the specimens thus doctored through the furnace, a portion of the original glaze absorbed during the first firing was brought out sufficient to cover the new ground and paintings, thus making the imitation complete, and greatly enhancing the value of the specimens. Skilful dealers have certain tests by which to detect the fraud; but it is only at Sèvres that it can be completely done, for there the model of every piece is preserved.

Although at the time of the French Revolution many fine specimens of Sèvres porcelain were destroyed in the royal palaces, and in the houses of the nobility, yet the royal manufactory at Sèvres received the support of the revolutionary government. During that period it was managed by three commissioners until 1800, when the first consul appointed M. Brongniart as director. We have already mentioned his name as the originator of the *Musée Céramique*. He held the appointment for forty-seven years, and was succeeded by M. Ebelman, the chemist. He died some time after Louis Napoleon became president of the French Republic, and there were many candidates for the post, among whom was the young and rising chemist M. Regnault, who had greatly distinguished himself by original discoveries, and by an admirable treatise on the science to which he had devoted his fine abilities. He submitted his testimonials to the government, and made personal application, when he was informed by the minister that his request could not be granted, on the ground of inex-

perience. M. Regnault then adopted the simple but straightforward course of addressing the prince-president on the subject, stating his qualifications, and meeting the charge of inexperience by referring to various scientific commissions appointed by the government to which he had acted as secretary—in many of which he had had the chief labour in conducting the experiments, and drawing up the reports. Some weeks elapsed, during which no answer was vouchsafed to M. Regnault's letter; but in due course the directorship of the Sèvres works was brought before the prince. The form of appointment was placed before him to fill in the name of the candidate, and to sanction it with his own signature. The minister stated the name of the person selected by the government for the office, and what were his qualifications, and when the minister had done speaking the prince filled up the blank with a name, and attached his own signature; but what was the surprise of all parties concerned to find that instead of the name of the person recommended, the prince had written that of Victor Regnault.

In the Ceramic Court there are some beautiful specimens of old Sèvres porcelain, lent by the Duke of Devonshire. There is also an interesting collection of royal *plate-tendre*, made by the express order of Louis XVI., and exhibited at the fête of Christmas, 1783, at Versailles—the corresponding pieces being in the possession of her Majesty at Windsor Castle. There is also a fine specimen of the jewelled porcelain of Sèvres, from Lady Rolle's collection; and some specimens of the earlier porcelain of St. Cloud. There are also some specimens of modern Sèvres from the collection of James Fergusson, Esq.

We cannot omit to notice in this place the admirable modern jewelled porcelain exhibited by Mr. Alderman Copeland, a specimen of which is represented in Fig. 181. The ground is deep blue, and there is a slightly raised beading of white enamel with some specimens, apparently, of turquoise and malachite.

The other porcelain manufactories of France may be briefly named as follows:—Chantilly, of which there are specimens in the Ceramic

ay, 1750. There are also seven manufacturers of hard porcelain in Paris.

The example of the sovereigns of Germany in manufacturing porcelain extended, as we have seen, to other places. At the commencement of the eighteenth century an Italian nobleman established a large manufactory at Doccia, near Florence, and being conducted with taste and spirit, it appears to have met with much success. But the quality of its wares declined as works in other parts became multiplied. Collectors also esteem the porcelain of Venice, the manufacture of which ceased in 1812. Specimens of it



Fig. 181.—MODERN JEWELLED PORCELAIN (COPELAND).

may be seen in the Ceramic Court, as well as that of Doccia, already mentioned. Towards the end of the last century a factory was established at Vineuf, near Turin; but the most celebrated factory in Italy is the Capo di Monti, at Naples, of which there are several choice and beautiful specimens in the Ceramic Court—such as a vase lent by Mr. David Falcke, and specimens from Lady Molesworth's collection. This manufactory is also of royal origin. It was founded by Charles III., in 1736,—a sovereign who appears to have excelled in fictile ardour the other royal and imperial amateurs, for he is said to have worked in the manufactory with his own hands. But as the sublime often merges into the ridiculous, our respect for the royal artisan is somewhat diminished when we learn that during the fair held every year before the royal palace at Naples, a shop was opened for the sale of the royal productions; that the king was informed every day of what was sold, and who were the purchasers, and that there was no surer road to royal favour than to become a purchaser at this shop. When this sovereign became King of Spain, he established a factory at Madrid, at the expense of that at Naples, where he had served his apprenticeship. His successor, Ferdinand, gave permission for the establishment of other porcelain works, and permitted his workmen to assist in their establishment—a permission which they interpreted so liberally as to rob the royal works of its gold and silver models, and other valuables. The royal factory terminated its existence in 1821. The porcelain of Capo di Monti is not, as in many other cases, based upon that of some rival manufactory. Its peculiar beauty and excellence depend on the design—from shells, corals, embossed figures, &c., exquisitely moulded in high relief. Mr. Marryat gives a wood engraving of a basin, and a coloured plate of an ewer, "formed of a variety of native sea-shells grouped together, interlaced with branches of coral, and ornamented with shells of a smaller size, all being moulded and coloured from



Fig. 180.—JEWELLED PORCELAIN OF SÈVRES.

Court, and which owed its origin, in 1735, to a workman from St. Cloud; Menecy, founded in 1735, under the patronage of the Duc de Villeroy; Sceaux-penthièvre, established in 1751; Clignancourt, under the patronage of the Duke of Orleans, 1750; Etiolles, near Corbeil, 1766; Bourg la Reine, Paris, 1773; Lille, established, it is said, in 1708, when the Dutch had possession of the town. In 1785-6 experiments were made on the use of coal instead of wood in firing the hard porcelain, which were considered on the whole successful, although the use of wood is continued in the principal factories up to the present time. Arras, 1782; Tour-

nature." The same authority regards the tea and coffee services as perhaps the most beautiful porcelain articles ever manufactured in Europe for transparency, thinness of the paste—equal to oriental egg-shell, elegance of form, and gracefully-twisted serpent handles, but especially for the delicate modelling of the ornamental groups of classical and mythological subjects in high relief, painted and gilt, and contrasting well with the plain ground.

The factory at Madrid, in the gardens of the palace of *El Buen Retiro*, was established in 1759, by Charles III., as already mentioned. During several reigns the works were conducted with the utmost secrecy; they were destroyed by the French in 1812. The ware resembles that of Capo di Monti, as may be seen by examining some specimens in the Ceramic Court. In Portugal there is a factory of hard porcelain near Oporto.

In passing from these historical into manufacturing details, the reader need scarcely be reminded that the progress of improvement in the Useful Arts, depending, as it greatly does, on the advance of chemical science, has enabled the manufacturer to produce wares rivaling those of Dresden and Sevres at a far cheaper rate; so that it is now no longer a peculiar mark of high birth or of great wealth to be served on porcelain of fine quality. A service of Sevres porcelain of a good period would have cost 30,000 livres; one made at Chelsea is said to have cost £1200, and the Dresden ware was equally expensive. A visit to the Ceramic Court will show how successful our modern manufacturers have been in producing exquisite porcelain at rates which, though high, are not to be compared with those of the olden time,—besides which, when the most costly porcelain was manufactured, the descent from it to common crockery was sudden and abrupt; now, however, the transition is by a series of nice gradations, including a large variety of wares, suited to all tastes, and to the varying means of purchasers. Driven from their much-loved porcelain, royalty, and persons who are fond of distinction, have resorted to gold and silver plate; but even here the progress of the Useful Arts will not leave them unmolested, nor apparently unrivalled, as our recent description of electro-gilding and electro-plating, and Messrs. Elkington's display in the Crystal Palace, will show. If, then, the rich and the great are thus deprived of material distinctions, let us hope that they will shine forth the more brightly in those higher and more noble distinctions which spring from mental sources; and employ their worldly position and advantages, as many of their class are now happily doing, in alleviating misery, checking vice, and acquainting themselves with the real condition of the suffering and oppressed among their fellow-men.

Still, however, for porcelain of the finest kind, and of the highest style of ornamentation, high prices will be asked and given so long as there is a demand for these fragile treasures. Lord Ward gave £1500 for a dessert-service of Sevres; Lord Hertford £1000 for two vases; Mr. Mills the same; one of the Queen's vases has been valued at £1000; Mr. Minton received £1000 for his service of turquoise and Parian. But the great demand for earthenware is for those kinds (and their name is legion) which are in daily use at our tables, and the trade in earthenware has gone on increasing to a remarkable extent during the last few years. In the year 1835, the declared value of earthenware exported from the United Kingdom was £540,421; in 1853 it was £1,338,370; in 1854 it was £1,306,146—which last two values were represented respectively by 99,760,661 pieces, and 92,541,843 pieces—a cup and a saucer, for instance, being reckoned as distinct pieces. Our exports extend to most parts of the world, including Russia, Austria, Turkey, and even France, the classic land of fine pottery; and such was the effect of the Great Exhibition of 1851 that, whereas in 1848 France took of us 29,226 pieces, in 1851 she took 296,871 pieces. But the most surprising fact connected with the Exhibition was the absence of earthenware in the American department; for, with the exception of a solitary specimen from Cincinnati, somewhat resembling our Rockingham ware, it seemed as if that vast continent had neither potteries nor potters: indeed, the American trade absorbs nearly the half of our exports in earthenware.

The regulations by which English earthenware is admitted into foreign states are somewhat clumsy. The German and Italian states levy the duty on the weight—so that Wedgwood, from the lightness of his wares, had long the command of the market in those countries. In France the duty on common English china of one colour, without gilding or ornament, is 164 francs per 100 kilogrammes (200 lbs.); for fine china, 327 francs for the same weight. But the most whimsical tariff is that of Portugal, which charges by

colour—so that, as Mr. Wall remarks, "no man's pocket could stand the choice of a rainbow pattern. The greater the variety of colours, the heavier the duty; and a manufacturer conversant with the details and niceties of the trade could almost detect a Portuguese, not by his accent, but by the service he chose, and test his wealth by the colours he selected."

Our concluding remarks on the Birmingham Court referred to the effect of exclusive privileges and government patronage on the growth of Art-manufacture. In most cases, the effect has been to produce articles of luxury adapted to the tastes of the privileged few, rather than wares within the reach of the great bulk of the community. When trade is left to itself, it will find out what are the wants and tastes of the community at large; and, in the case of the Ceramic Art, it can only succeed by rapidity of design and execution, convenience of form, colours both lasting and attractive, and, above all, cheapness. The question is, are these qualities compatible with the artistic portion of the manufacture, which requires genius for original conception, leisure for study, accurate drawing, a good knowledge of inorganic chemistry, together with all the technical resources of the art. "The tendencies of the age," says Mr. Wall, "to save labour, to lessen expense, and to multiply production, are abstractedly all adverse to the development of taste; and I often think what advantages to Art would be gained if more breathing-time could be afforded to genius by the establishment of cities of refuge in Italy and Greece, where artistic feeling could fly for peace and repose, and perfect under a warmer sun the education of the student's eye; freed as he then would be from the trammels with which he is now encumbered, working, as he too often does, on his own account for his own daily bread. Although, in the present circumstances of the times, adventitious assistance is out of the question, the truth must be told, the struggle is arduous, and almost impossible; for hitherto, whether we look to the oriental, the majolica, the Dresden, the Sevres, or the Chelsea, every manufacture of porcelain (which has held for any length of time any influence on the public mind) has been supported by public money. We know it now to be impossible, and it is on that account that we ask with confidence for the establishment of schools of design—an academy for porcelain as there is for pictures—giving to every student the means of appreciating the power of pottery, by finding in local as well as metropolitan museums the impress of Raphael's immortal mind."

As the diamond is, chemically speaking, identical with a piece of common charcoal, so the finest piece of porcelain holds an intimate relation with a common brick or tile. The essential ingredients of every article in pottery and porcelain are silica and alumina. The pure compound silicate of alumina is an ideal type to which the finest porcelain strives as nearly as possible to attain; while in the coarser varieties impurities are regarded as of little moment. Such impurities consist of iron, lime, potash, &c., in various conditions, which give character to the manufactured wares. In some cases, where it is possible to obtain silica and alumina nearly pure, substances are added for imparting a certain degree of fusibility to those refractory materials, forming therewith vitrifiable double silicates; and when such substances are diffused through the paste formed by silicate of alumina with water,—in some cases with silica in excess, in others with excess of alumina,—the cohesion and hardness of the mass are increased.

We have already pointed out the distinctions between soft and hard, as applied to pottery and porcelain. Soft pottery, composed of silica, alumina, and lime, is usually fusible at the heat at which porcelain is baked, and can be scratched with a knife or file. Stoneware consists of silica, alumina, and baryta, and is a kind of coarse porcelain. Hard porcelain contains a larger proportion of alumina and less of silica than the soft: it is fired at a higher temperature, and has a greater density than the soft. Soft porcelain contains a larger proportion of silica, together with alkaline fluxes, and is soft in two senses—in being less able to resist a high temperature, and being easily scratched with a knife.

After the article in clay has been passed once through the fire, it becomes converted into a porous substance, termed *biscuit*; it is rendered impermeable to water and durable by means of *glazing*, or *glassing*, i.e. covering it with a thin layer of glass. In fine wares, such as porcelain, the vitreous glaze resembles the substance of the paste, only it must melt at a lower temperature than the article which it is destined to cover and protect. The glaze combines so well with the biscuit that on breaking a piece of good porcelain the line of

separation between the biscuit and the glaze cannot be seen; the glazes for pottery are much more fusible. The materials of porcelain are selected and prepared so as to insure the production of a white biscuit; the glazes also are colourless. The clays used in making pottery are impure, and frequently contain protoxide of iron, which is converted by the oxidising influence of the flame into the red peroxide. The resulting red biscuit has its colour concealed by an opaque or coloured glaze, which differs from porcelain glaze in not combining with the biscuit, but forming a distinct layer on its surface. In the case of porcelain, and the finer descriptions of pottery, there are therefore two firings; in the first of which the soft plastic material is converted into biscuit, while in the second the ornaments and glazes are vitrified. In the case of coarse pottery, economy of production requires that the glazing shall be performed simultaneously with the baking; for which purpose, when the wares have been raised to a very high temperature, a quantity of moist salt (chloride of sodium) is thrown into the kiln: this salt becomes volatilised and decomposed in the presence of moisture and of hot clay, hydrochloric acid is disengaged, and the wares become covered with silicate of soda, which, combining with the silicate of alumina, forms a fusible double alkaline silicate, or glaze, on the surface of the articles.

The lowest application of the potter's art is the production of bricks and tiles. For such coarse pottery the materials and manipulation are very rude: the clay is kneaded, or ground, in a primitive kind of mill, called a *peg-mill*, the articles are moulded by hand, exposed to the air in order to get rid of superfluous moisture, and then fired in clamps, or kilns. If the articles have to be exposed to a high temperature, as in the case of fire-bricks and tiles, a refractory clay must be selected, or one which contains only a very small proportion of the alkaline earths and of iron—for these act the part of a flux, and render the clay fusible at high temperatures. The proportions of silica and alumina in the fire-clays vary considerably—the silica from 50 to 70 per cent., and the miscellaneous ingredients from $1\frac{1}{2}$ to upwards of 7 per cent. The celebrated Stourbridge clay contains in 100 parts—silica 63·7, alumina 22·7, oxide of iron 2·0, water 10·3.

In the manufacture of earthenware the two principal ingredients are clay and flint. The clays commonly used in Staffordshire are supplied by Devonshire and Dorsetshire—the latter county furnishing *brown* and *blue* clays, and the former *black* and *cracking* clays. The black clay owes its colour to the presence of bitumen, or coaly matter, which disappears in the firing, and leaves a nearly white biscuit. Cracking clay is a pure white, but cracks during the firing, so that it requires to be mixed with other clays. Brown clay is liable to an imperfection called *cracking*, or cracking of the glaze. Blue clay is the best for ordinary purposes: it bears a larger proportion of flint than the others, and produces a whiter ware. For porcelain the china clay of Cornwall is used. It consists of felspar, one of the ingredients of granite in a partially decomposed state. It is collected by breaking up the stone with a pick, and throwing it into a stream of running water. This washes off the argillaceous parts, and keeps them suspended; while the quartz and mica, the other two ingredients of granite, sink at once to the bottom. At the end of these rivulets the water is dammed up, forming *catchpools*, where the clay subsides in a solid mass, and can be dug out in blocks on drawing off the water. When dry it is crushed, packed in casks, and sent to the pottery as kaolin, or china clay. It is a white, impalpable powder, consisting of 60 parts alumina, and 20 of silica. A certain proportion of undecomposed felspar is sometimes added.

Flints for the manufacture are obtained from the chalk districts; those with yellow spots are rejected, for they indicate the presence of iron, which would stain the ware. Steatite, or soap-stone (silicate of magnesia), is sometimes used in making porcelain. The mineral called *pegmatite* contains all the materials for hard porcelain ready mixed—namely, felspar, kaolin, and a small proportion of prismatic quartz. Soft porcelain, as now manufactured, consists of kaolin, Cornish stone, and bones; the last ingredient forming a kind of semi-transparent enamel, which improves the transparency of the ware.

All these materials require a careful preparation. In the case of pottery, the blue and white clays are mixed in the proper proportions in a trough with the requisite quantity of water, and are left all night. In the morning they are well worked up by means of a wooden instrument, called a *blunger*, Fig. 182, until a smooth pulp is

obtained, a pint of which weighs 24 ounces. To facilitate the blunging the clay is sometimes *pugged* in a cylinder, through the



Fig. 182. BLUNGING.

centre of which runs a shaft furnished with a spiral line of knives inclining downwards, while another series of knives is fixed to the interior of the cylinder—so that as the shaft revolves, the knives cut up the clay, force it downwards through an opening in the bottom, whence it is removed to a vat, and blunged by machinery.

The flints are burnt in a kiln, and quenched red-hot, which facilitates their being crushed at the flint-mill, Fig. 183, which consists of stampers and a strong iron grating. The fragments thus formed are ground in the *flint-pan*, Fig. 184, in which a vat with a smooth quartz or felspar bottom is furnished with a central shaft, the motion of which swing-round the runners, consisting of very hard silicious stones, called *chert*, which reduce the broken flints or felspar, in the course of a few hours, to powder. forming them, with the water, into a creamy mixture, which is passed into another vessel of water, and kept in motion by a revolving shaft and arms—the effect of which is that, while the finer particles of flint remain suspended, the larger ones sink to the bottom. The water containing the finer particles is from time to time drawn off into a reservoir, where the flint powder subsides. It is considered fit to mix with clay when a wine pint of it weighs 32 ounces. The density of the diluted clay being also adjusted, the manufacturer mixes these two

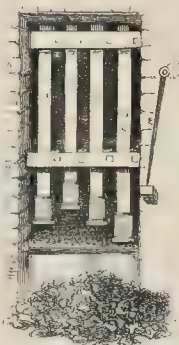


Fig. 183.—FLINT-MILL.

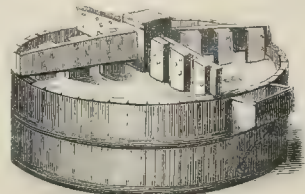


Fig. 184. FLINT-PAN.

principal ingredients in such proportions as experience has dictated for the kind of ware intended to be produced. The diluted mixture of clay and flint, after being well agitated, is passed through sieves of hard spun silk, kept in constant motion, and arranged on different levels, as shown in Fig. 185, so that the mixture may pass from coarser to finer sieves, and at length come out quite uniform and smooth, in which state it is called *slip*. The water which was used as a vehicle in straining and purifying the mixture being now in excess, has to be got rid of by the application of heat, in what is called the *slip-kiln*, a portion of which is shown by the side of the blunging-pit, Fig. 182. The kiln consists of long brick troughs, with flues under them, and during the early part of the evaporation the slip is kept in constant agitation, to prevent the flint powder

from subsiding. There is also tendency in flint and clay, when water is present, to form a kind of mortar which quickly hardens,



Fig. 185. MIXING.

an effect which is prevented by diligent stirring. In about twenty-four hours bubbles of steam cease to be formed on the surface, and the mass, when cut, is uniform in texture and sufficiently consistent. The abundance of fuel in the potteries has led to this wasteful method of depriving the mixture of its superfluous water. In countries where fuel is scarce, better and more scientific methods are adopted for the purpose, but these we will not stop to describe. The next process is called *wedging*, it consists in cutting up the mass into wedges by means of a spade, and dashing them against each other with considerable force, so as to get rid of air bubbles, which might otherwise form blisters in the ware. This wedging should be performed at intervals during several months, in order to secure a fine grain and freedom from flaws. The Chinese are said to keep a store of materials in this way many years in advance. During this *ageing* of the paste, as it is called, a kind of fermentation goes on—carbonic acid and sulphuretted hydrogen are disengaged, and the paste slowly improves in texture and in colour. The next process is that of *slapping*, in which the workman takes a mass of the paste weighing sixty or seventy pounds, and dashes it down upon the bench before him. He frequently divides it by drawing a wire through it, and, taking up one portion, dashes it down on the remainder, taking care to preserve the grain of the paste, by slapping the layers parallel to each other, and not obliquely or at right angles, otherwise the ware would be liable to fall to pieces in the firing.

The paste is now ready for being formed into some of the innumerable articles included in the term *crockery*. The most ancient mode of proceeding is called *throwing*, which is performed at the potter's wheel, or lathe, Fig. 186. It consists of an upright shaft,

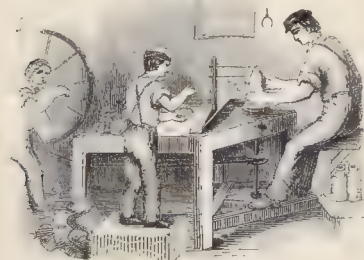


Fig. 186.—THROWING.

about the height of a common table, on the top of which is fixed a disk of wood of sufficient diameter to support the article which is to be made. The lower end of the shaft, which is pointed, runs in a conical step, and the upper part in a socket a little below the disk. The shaft carries a pulley, grooved for three degrees of speed, over which passes an endless band from a fly-wheel, the revolution of which sets the shaft in motion. The paste, as received from the

slapper, is cut up into portions with a brass wire, each of which is weighed, slapped with the hand, and rolled into a ball. The thrower, seated as shown in the figure, takes one of these balls, dashes it down upon the centre of the revolving board, and with both hands kept wet by occasionally dipping them in water, squeezes up the clay into a high conical mass, and again forces it down so as to get rid of air bubbles. With one hand, or finger and thumb in the mass, he gives the first rude form to the vessel, and with a piece of horn, shell, or porcelain, called a *rib*, which has the profile of the shape of the vessel, he smoothes the inner surface, gives it the proper shape, and removes the inequalities left by the fingers, during which operations the assistant keeps the wheel moving at the varying degrees of speed, according to the requirements of the thrower. That the articles made may all be of the same dimensions, the thrower has a peg, or stick, placed opposite to him at a certain distance from the centre of the vessel, whereby he is able to judge of the proper height and diameter. The thrower's business is simply to produce circular vessels, such as tea-cups, basins, &c., handles and ornaments being added afterwards.

As soon as one vessel is formed, and cut off at the base with a fine brass wire, the baller supplies another ball of clay, and the newly-made vessel, said to be in its green state, is lifted off the wheel and conveyed into a warm room, where it parts with sufficient moisture to allow of the next operation, which is *turning*. This process scarcely differs from the turning of wood or metal; the green vessel is placed upon the chuck of a lathe, a steel tool is applied, and the surplus clay rapidly removed in shavings. It is also smoothed and solidified by the pressure of a broad tool, and then delivered to the handler, or dried for the biscuit-oven. The clay for the handles is first formed into a cylindrical shape at a small press, which forces the clay through a metal tube of the required size and form. The paste thus formed is cut up into lengths and shaped by hand. The handles are attached to the articles by means of slip, superfluous clay is scraped off with a knife, and the article is cleaned with a damp sponge. Where figures and foliage are required, they may be formed in moulds or by hand, and are attached with slip as before.

The second method of forming articles is by pressing, for which purpose plaster moulds are formed of the required size and pattern. Moulds for plates and other shallow articles consist of one piece only, and the process by which such articles are formed is called *flat-ware pressing*. In forming a plate, for example, the man stands at a bench before a whirling table similar to the thrower's, and on his left hand is a *batting-block* of wet plaster, and a mass of well-beaten paste, which he cuts into lengths with a wire; one of these he bats out thin upon a block by striking it with a plaster mallet called a *batter*, and he smoothes the surface with the flat side of a knife. The boy then places a mould on the whirler, and stations himself at the handle of the *jigger*, or apparatus for giving motion to the whirler. The man places the paste on the mould, which is then set whirling, and he presses it down close, first with his hand, and then with a profile, or earthenware tool. Where great precision is required, the profile is mounted in a carrier c, Fig. 187,

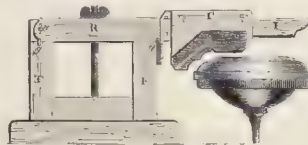


Fig. 187.

which is adjusted by screws upon the arm I of the frame FF, and fixed to the proper height by the screw R. The arm I descends in a groove g to the exact depth required for the thickness of the plate, when the proper shape is given by whirling, smoothing, pressing, finishing with a wet sponge, trimming the edges, &c. The maker's name or other mark is stamped on the back, the boy catches up the mould with the plate upon it, runs with it to a hot room, places it on a shelf to dry, and returns with the empty mould of a plate which has been drying; in the meantime, the man bats out another piece of paste for another plate. In about two hours the plates have become sufficiently dry to be removed from the moulds; but these having absorbed a good deal of moisture from the plates, are left to dry before they can be used again.

Deep vessels are formed by a process called *hollow-ware pressing*, in which case the mould is in several parts, as in Fig. 188, which

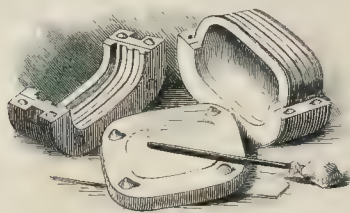


Fig. 188.

represents a mould for a foot-pan. The base of the mould has four projections, which fit into cavities of the two halves for the upright

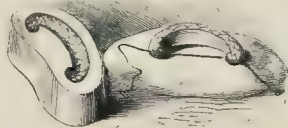


Fig. 189.

portion: one of these uprights is shown with the pan in it. In moulding such an article the paste is kneaded, batted out, and spread over the bottom, which is placed on a flat board, mounted on a vertical axis, so as to turn round easily: two halves are each lined with paste, which is well worked into the grooves, and made to project a little at the edges. Each half is then placed upon the base piece, and secured by passing a string round the outside of the mould. The joints are then worked with the wet finger, fresh paste is added where required, and slip



Fig. 190.

is applied so as to make the seams adhere. The handles are prepared in plaster dies or moulds, as in Figs. 189, 190. For elaborate figures the mould often becomes very complicated; thus, at Meissen, we were shown models for four vases, emblematical of fire, air, earth, and water, the moulds for which consisted of 150 separate pieces.

There is yet another method of giving form to articles in pottery or porcelain—namely, by *casting*. The paste is reduced to the consistency of slip, and is then allowed to flow into a plaster mould; the plaster quickly absorbs water from the portion which comes in contact with it, so that a thin shell of paste is formed on the surface of the mould, and the central fluid portion is then poured off. When this is partly dry, a second quantity of slip is poured in, and this in turn being poured off, the mould and its lining are put into a hot room to dry. The cast is then taken out of the mould, and is carefully examined and touched by the modeller. We have seen the delicate coffee-cups of Sèvres formed in this way, and also the porcelain statuettes of Minton and Co. The celebrated lace figures are first formed in this way without the lace; and in finishing the cast real lace is dipped into slip, in order to imbibe the fictile material, so that when subsequently passed through the furnace the heat destroys the thread, and leaves porcelain lace in its place.

We have already spoken of the beautiful copies of busts, reduced from the originals in the British Museum; and we may here refer to the statuettes and other works, so common about town, known as *Parian*, *Carrara*, or *statuary porcelain*. It is a true porcelain; but its peculiar texture, which allows the light to penetrate into it to a certain depth, whereby its softness is produced, is due to the use of a species of felspar instead of Cornish stone in its composition; while its agreeable yellowish-white tint arises from the presence of a small quantity of oxide of iron, which, during the firing, forms a peroxide, and the silicate thus produced imparts the tint. During the firing the figures contract as much as one-fourth, so that much skill and knowledge of the human form are required, especially when it

is considered that each subject is cast in a number of separate pieces, which the modeller has to join and repair before the firing. Messrs. Minton have successfully adapted the Parian to a chimney-piece. We have also referred to the revival of majolica ware by the same eminent firm; and we may likewise notice their extensive manufacture of encaustic tiles. At the time when we visited their manufactory the tiles were formed of a body of red clay, faced with a finer clay, bearing the ornamental pattern, and strengthened at the base with a thin layer of the clay, different from the body, to prevent warping. The three layers being thus put together in the green state, the tile is put into a box press, when a plaster of Paris slab, containing the pattern in relief, is brought down upon the face of the tile, and impresses in the soft tinted clay the design, which is afterwards to be filled up with clay of another colour. The maker's name is stamped on the back, and some indentations are made to cause the mortar to adhere. The pattern is deeply indented in the face of the tile, as shown in Fig. 191, and over this is poured a quantity of slip, properly coloured, so as completely to cover the surface, and hide the pattern. When the slip is sufficiently hard for the purpose, a portion of it is scraped away, as shown in Fig. 192, so as to reveal the pattern and the ground. The tile is then finished up, dried in a warm room, and afterwards fired.

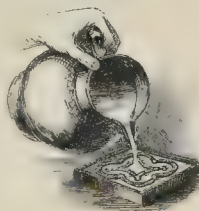


Fig. 191.

We are also indebted to Minton and Co. for the manufacture of terracotta, or baked clay, resembling stone.

We have now to notice the firing. The temperature at which ceramic wares are fired has much influence on their character and texture. The usual effect of firing is to convert the article into a hard sonorous biscuit, more or less porous, requiring the application of glaze and a second firing to remove the porosity, and give a durable smooth surface. In the case of porcelain the temperature of the first firing is sufficient to produce incipient vitrification, so that, as far as use is concerned, the article is complete at one firing, the second firing being for the purpose of fixing the enamel ornaments, &c. The firing is always a costly process, requiring much fuel and long and skilful management—hence it was a great improvement when Wedgwood introduced a ware so compounded

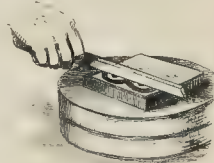


Fig. 192.

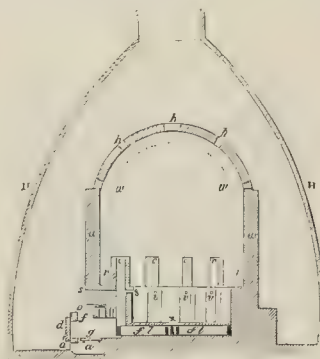


Fig. 193.

that partial vitrification took place at the first firing, thus rendering a second unnecessary. The method of glazing by salt at the first firing has already been referred to.

The arrangement of the kiln depends upon the kind of ware to be fired, and the nature of the fuel. A section of a pottery kiln is

shown in Fig. 193. It consists of a massive cylinder of brickwork *to to*, surmounted by a dome, with apertures *h h* for the exit of smoke, and surrounded at some distance by a hovel *H*, which protects the kiln from the weather. Heat is supplied by six or eight fireplaces, placed at intervals round the cylinder; one of them is shown in the figure. *f* is the fire; *g* the grate; *a* the ashpit; *d* the fire-door. The draught is regulated by means of the openings *o* and *a'*. Between the wall *to* and the chimney *c* is a space *r* about 15 inches wide, and 3½ feet above the floor of the kiln; below this floor are flues *f l* for the circulation of the flame, which flues all meet in the centre *x*. At *c c* are vertical flues, and at *s v* sight-holes, to allow the men to watch the fire, and regulate the draught of the flues *c c*.

Porcelain, and the better kinds of pottery are protected from the direct action of the fire by being placed in cases, called *seggars*, made of a mixture of fire-clay and old ground seggars. Much skill is required in packing the articles in the seggars, so as to economise space, and give them the proper temperature. If the articles are not likely to soften or vitrify, they may be placed in the seggars in contact, so as mutually to support each other and prevent distortion; some pieces may require supports to prevent warping, as in Fig. 194, where, the vessel being thin, a piece of fire-clay is stretched across. For some kinds of porcelain a quantity of sand, or powdered flint, is interposed between the pieces; saucers are kept in form by an earthenware ring; vessels of similar forms are packed in the seggars *s s*, Fig. 195, fitted together by rings of clay *c c* to make them tight, while *p p* are projections for supporting a vessel of fire-clay *s s*, in which the porcelain cup, or bowl, stands.



Fig. 194.

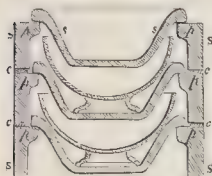


Fig. 195.

Fig. 196 shows another arrangement, in which the projection *p* supports a ring *c*, on which the edge of the cup rests, while the handle *h* passes through a space cut out of the ring, and the base *b* occupies this internal cavity. The seggars, when filled, are conveyed to the furnace, and piled up so that the flat bottom of one seggar acts as a cover to the one beneath it; a ring of soft clay on the upper rim of each preventing the entrance of the smoke. Fig. 197 represents a porcelain-kiln in the act of being filled, and Fig. 198 the arrangement of the seggars, some of them being in section for the purpose of showing the enclosed pieces, of which

many thousand may be included in one firing. The flame enters the kiln by the openings *ff*, and is prevented from playing directly on the seggars by a guard of fire-clay *pp*; and the *bungs*, or piles of seggars *B B*, are steadied by means of short struts. *P* shows the method of arranging a porcelain slab for firing. When the kiln is filled, the door is bricked up, the fires are lighted—usually in the evening—and are kept up with considerable force all night. Early in the morning the *first watch* is taken out to see how the firing goes on. These watches, or trial-pieces, are rings of fire-clay, so placed in the kiln that the workman can hook out one from time to time with a long iron rod, and he judges by the colour produced by the heat whether the firing is going on properly, and when it has been continued long enough. In from thirty-three to forty hours the process may be complete; the fire is then allowed to go out, and the contents of the kiln are left to cool during twenty-four hours or more—as much as fourteen tons of coal having probably been consumed in the operation. The ware, as it comes from the kiln is said to be *bisqued*, and it is called *biscuit*; not because it has been “twice cooked,” or baked, but from its resemblance to well-baked ship-bread. In this condition it is ready for receiving coloured ornaments and for glazing. The pottery of some rude nations is rendered impermeable to water by rubbing it while hot with tallow, which fills up the pores, and, by being charred, gives

the ware a black colour. Even some of the beautiful Etruscan and Greek vases are varnished with a black, carbonaceous, non-vitreous

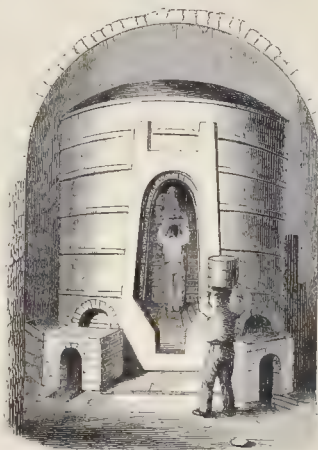


Fig. 197.

substance, which wears off in the handling, and may have been produced by a similar process. In Spain and Italy wine and oil jars are rendered water-tight by rubbing them with wax.



Fig. 198.

The usual method of finishing pottery and porcelain is by means of a vitreous glaze, the object of which is to render the ware impermeable to liquids, to impart an agreeable durable lustre, and to preserve the colours and patterns. The glaze must not have too strong an affinity for the paste, or during the second firing it will be absorbed into the body of the ware, instead of remaining at the surface, to which it should adhere firmly, and expand and contract with the ware, so as not to be liable to craze or crack.

The ingredients of glazes are numerous. Where the point of fusion is required to be high, the felspars and certain volcanic *scoria* may be employed. Among other non-metallic glazes, are common salt, potash, boracic acid, phosphate of lime, and sulphate of baryta. Another class of glazes consists of earthy and metallic substances, mixed or fritted into a glass—such as silica and lead, or the enamels of silica, tin, and lead. A fourth class of glazes includes metallic oxides—such as those of manganese, lead, and copper. Metallic and earthy substances, if not previously fritted, form a glass, by combining with the silica of the paste they are intended to cover. But such glazes are usually soft, and are liable to be dissolved by acid and fatty substances, so that glazes containing lead may be sources of danger. Some glazes are transparent, some are opaque, and some are coloured. A paste of a pure white, or of an agreeable tint, is improved by a transparent glaze; but if the clay have a bad colour, though well fitted for pottery in other respects, it may be dipped into opaque glazes even before the first firing, and an agreeable effect be produced by this species of veneering. Opacity is given to glazes by means of oxide of tin; colour by means of the oxides of manganese, of copper, and of iron; while, by introducing

these, together with the oxides of cobalt and of chromium, into opaque and transparent glazes, much variety is produced. Of late years borax has been substituted for lead in the glaze for common pottery, a change which liberates the workpeople from a large amount of disease. Pegmatite forms a good glaze for hard porcelain; but for soft porcelain a glass is fritted and mixed with oxide of lead or earthy materials.

In applying the glaze to the biscuit it is reduced to a fine powder, and mixed with water; the biscuit being plunged therein, the porous material immediately becomes coated with the glazing powder. When articles are glazed in the green state—such as the cheaper kinds of pottery—the glaze may be put on with a brush.

In the second firing, which is in the glaze or gloss oven, the pieces are packed in seggars, as in the kiln, and they are prevented

with a mixture of oxide of cobalt, ground flint, and sulphate of baryta, fritted and reduced to powder, then blended with a flux of ground flint, and thick glass powder, which serves to fix the colour. This preparation is made into an ink by means of a composition of boiled linseed oil, resin, tar, and oil of amber. The coloured ink thus formed is made sufficiently fluid for use by being spread out on a hot iron plate, from which it is transferred by means of a leathern dabber to engraved copper-plates, also made hot, and the superfluous ink is scraped off with a palette-knife, and the surface of the plate is cleaned with a dossil. The workman next takes a sheet of yellow unsized paper, dips it into soapy water, lays it while moist upon the copper-plate, and passes it through a cylinder press. Here it receives the pattern; and a girl, called the *cutter*, then cuts away the white unprinted part, and leaves the pattern in its



Fig. 199.—MODERN STAFFORDSHIRE PORCELAIN (COPELAND).

from coming in contact with each other by means of little pointed supports and rests, known as *cockspurs*, *stilts*, *triangles*, &c., some of which are shown in Fig. 200; while the method of arranging the pieces in the seggar is shown in Fig. 201. The seggars being



Fig. 200.



Fig. 201.

arranged in the glaze kiln, the temperature is raised just enough to melt the glaze into a transparent glass, and allow it to unite with the surfaces of the biscuit. Watches, or rings of clay, covered with glaze, shown in Fig. 200, are drawn out from time to time to enable the workman to judge of the temperature.

When the ware has a pattern it is usually added before the glazing; thus, the blue design of a common dinner-plate is printed

separate portions, which are passed to the transferrer, who transfers the pattern from the paper to the biscuit, by placing the pattern



Fig. 202.—TRANSFERRING THE PATTERN.

with the printed side next the ware, and rubbing it with a flannel rubber, as shown in Fig. 202. The biscuit articles are placed in a tub of water to remove the paper, and the moisture thus imbibed is

got rid of by heating in an oven, and the articles are ready for glazing. In some cases the impression is taken from the engraved plate in oil only, on a flexible sheet of glue, called a *paper*, or *batt*, which receives enough oil to furnish two impressions to the biscuit; colour in a dry state is then dusted over the biscuit, and on removing it to an oven the oil is driven off, while the colour sinks in, and forms part of the glaze. The glue or india-rubber used for transferring the pattern can be cleaned with a wet sponge, dried, and used over again many times.

Painting on porcelain is, as already noticed, a Fine Art, requiring the skill of the artist. The figures are painted on the ware with a camel's hair pencil, and the colours are all metallic oxides, ground up with such vitrifiable substances as glass, nitre, and borax. The colours are pounded, and then ground with a small quantity of oil on a glazed palette. Oil of turpentine or of lavender is the usual vehicle, both for the colour and the flux. In painting, the artist rests his right arm on a board projecting from the table, while with his left he holds the article to be painted. Considerable judgment is required in the management of the colours, since they all have a dingy unpleasant hue, requiring the heat of the furnace to develop their natural brilliancy. The painting usually requires to be several times retouched and passed through the fire. When properly fired the colours have a smooth and creamy effect, and all the durability of enamels.

For gilding porcelain, pure gold is dissolved in *aqua regia*, when the acid being driven off by heat, the gold remains in a minutely divided state; it is then mixed with one-twelfth of its weight of oxide of bismuth, and a small quantity of borax and gum-water, which composition is supplied to the articles by means of a hair pencil. The gold ornaments are very dingy when they come out of the oven; but the lustre of the gold is brought out by burnishing first with agate and then with bloodstone. The metal platinum is used to impart a silver lustre, and also a lustre resembling polished steel. The iridescent lustre, called by the French *lustre cantharide*, is obtained from chloride of silver. An iron lustre is obtained by dissolving iron or steel in muriatic acid.

The fixing of the colours in the furnace is a delicate operation. The heat is regulated according to the indications of small por-

celain watches, painted with some of the enamel colours employed on the ware. The muffle-furnace employed for the purpose is shown in Fig. 203. The first firing is rather a trial than an actual result, since it informs the artist what is wanting in the application of the colouring oxides, &c.; and having retouched the parts requiring it, the ware is passed a second time through the muffle. Other retouchings and firings may be required to complete the work satisfactorily.

We have thus indicated, rather than described, the principal processes concerned in the manufacture of pottery and porcelain, and must now take leave of the Ceramic Court, inviting the reader's attention to the group of modern Staffordshire work (Fig. 199), from the establishment of Mr.

Alderman Copeland. The large open vase on the left has an antique effect, the ground being of a rich reddish brown, with slightly raised ornaments in blue, red, green, and gold. The piece in the centre is of a peculiarly chaste description, the ground being creamy white without glaze, and the pattern wrought in beautiful pale colours with dead gold. The small piece next it is a pure white figure of a boy, standing on a pedestal of blue, white, and gold, and holding on his head a blue and white basket fit to contain flowers. Partly hidden by the figure of the boy is an antique-looking piece, one of a pair having a striped groundwork of green, white, and drab, with a raised pattern of flowers, butterflies, &c., brightly coloured, and arranged in panels. We may appropriately conclude this notice of the Ceramic Court with a few specimens of early Flaxman-Wedgwood ware (Fig. 204), from the large and beautiful collection which Mr. Isaac Falcke has intrusted to the care of the Crystal Palace.

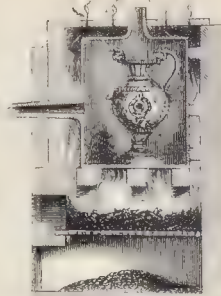


Fig. 203.



Fig. 204.—GROUP OF EARLY FLAXMAN-WEDGWOOD WARE.

THE GLASS COURT.

THE GLASS COURT of the Crystal Palace may be said to comprise the whole building—for what so appropriate to this beautiful material as a Palace of Glass! It is true that there is a court specially devoted to the sale of articles in glass; but it illustrates neither its manufacture, nor its rich and varied results, as produced by various countries and manufacturers. The Glass Court illustrates the productions of only one country, and one manufacturer:—Francis Steigewald, a Bavarian glass manufacturer, of Munich, announces on his card that “a large assortment is constantly exhibited at the Crystal Palace, Steigewald’s Court, Sydenham.” This will serve us as a basis for our remarks and descriptions; but remembering how meritorious was the display of British glass at the Great Exhibition of 1851, it is disappointing to find that no attempt has been made to display here our unrivalled skill and power in the production of various kinds of glass, from the finest to the cheapest; but there is consolation in the thought that the Crystal Palace itself is the most worthy contribution that the nation could offer on this subject.

There are very few artificial substances more calculated to win our admiration and esteem than glass. It is the triumph of the Useful Arts; for, in the absence of chemical knowledge, what so unlikely as that certain crude, and, for the most part, opaque materials, should become by fusion converted into a clear transparent crystal, capable of being blown, moulded, or otherwise wrought

into transparent vessels of great strength and lightness, and yet of great capacity? Nothing can be more appropriate for holding many of the liquid portions of our food; the eye detects at a glance any impurity, or is as quickly satisfied with the purity of the contents of a vessel of this material. From its great hardness and smoothness it admits of being cleaned with ease and rapidity. But perhaps the most important application of glass is to the glazing of windows. It is scarcely possible to realise the amount of discomfort in the houses even of the upper classes previous to the introduction of this material. The lights were closed with oiled paper in fine weather, or with wooden shutters or louver boards in foul, and were often placed high up, to mitigate the cutting draughts. We read of the astonishment of the people when Wilfrid, Bishop of Worcester, substituted glass for the heavy shutters in his cathedral. With the usual readiness of the uneducated to refer to supernatural agency that which they cannot understand, the people in the eighth century thought that a miracle had been performed, which allowed them to see the moon and the stars through a material which excluded the wind and the rain. Glass must, however, have continued long to be very costly, for it was some centuries in getting into general domestic use; and even so late as the middle of the sixteenth century it was recommended in a survey of the Duke of Northumberland’s estates to take out the glass of the windows during the duke’s absence, and lay the frames by in safety until



Fig. 205.—SPECIMENS OF ENGRAVED AND CUT-GLASS, CHIEFLY BY MR. W. NAYLOR.

his return, in order to save the cost of repair. So late as 1661, the windows of ordinary houses in Scotland were not glazed; but about this time the use of the diamond in glass-cutting becoming known, greatly facilitated the manufacture, and when once the glazing of windows became general, a peasant’s cottage was more luxurious than a palace had previously been. We see, too, in the mode of glazing how gradually the art of glass-making has improved. From the small lozenges of glass set in lead, and hung in iron frames, we had parallelograms of gradually increasing size, set in wood, and, at length, enormous plates, one of which is sufficient to glaze a shop-front, set in massive brass or bronze. Thus, while glass has promoted domestic comfort, it has greatly enlarged the boundaries of knowledge; it has introduced us to the opposite realms of vastness and minuteness, and shown up the wonders of the starry world and of the water-drop. Glass has been the means of creating several branches of science, and consequently of extending the dominion of mind over matter. Were it not for glass the science of optics would have no existence, photography would be unknown, and the condition of chemistry would be lower than it was, as left by the alchemists. Glass has given to the eye, rendered defective by age or malformation, the means of exercising the most precious of the senses. By means of glass we enlarge the apparent

boundaries of our rooms, and add to their cheerfulness by the use of plane mirrors, which also serve many useful purposes at the toilet. By means of glass our candles shine with greater brilliancy, and show the beautiful prismatic effects of the material which led the great Newton to discover the compound nature of light. By means of glass the lighthouse is made to converge its rays to the distant horizon, and thus to deprive the ocean track of some of its terrors.

Glass was a rare and costly production among the ancients, who regarded the best specimens much in the same way as we regard the most precious stones. Clear and transparent crystal glass was so regarded, for the inferior kinds of white glass, and many kinds of coloured glass, appear to have been known at a very early period. Some of the Egyptian monuments represent glass-blowers at work; glass beads have been found in Egyptian tombs; and glazed pottery was common before the exodus of the children of Israel from that land. The cinerary vases of greenish glass found in Roman barrows are thought to be of Egyptian or Roman manufacture. Glass vessels have been found among the ruins of Herculaneum; and there is evidence that the Anglo-Saxons had some acquaintance with the art of making glass. There is, however, in the British Museum a specimen of glass supposed to be the most ancient in

existence. It was dug out of the ruins of Nineveh by Mr. Layard, and is thought to have been manufactured at least seven centuries before the Christian era. On the revival of learning in Europe,—indeed, as early as the beginning of the thirteenth century,—Venice was the first to manufacture glass for domestic use: her mirrors, drinking-glasses, and ornamented glass, were long celebrated, and are even now much prized by collectors, although inferior in value to productions in pottery and porcelain, which admit of such high pictorial embellishment. Glass suffers by most attempts at ornamentation. Its transparency and crystal purity are its chief ornament, and anything which tends to conceal these properties can scarcely be in good taste. Venetian glass, however, is remarkable for a great variety of ornament, which involves this objection; it is reticulated, flashed, and enamelled, and it has such ornaments as beads and narrow ribbons of glass running in lines over its surface, rendering it difficult to preserve the glass from fracture, and almost impossible to clean it, to say nothing of forms, which are not only ugly in themselves, but make the cleaning out of the interior also difficult; hence, collections of glass have not the historical interest which attaches to collections of fictile ware. Venice unwittingly gave lessons to Bohemia in the production of ornamental glass, which still retains the marks of its origin in the reticulated pattern, the Eastern forms, the taper stem, the variety of colours, the engraving, and imitations of precious stones. The use of glass continued so long to be confined to courts, and the frequenters of courts, that even its manufacture was thought to be too refined an employment for common men. A law was passed in France, in the reign of Louis IX., granting to the sons of the nobility and to born gentlemen the sole right of establishing glass-houses, and working therein. The gentility of the art may be traced in the term "gentlemen glass-blowers," which has continued in use in England. The first English glass-house was established in 1557, in Crutched Friars, London, for the manufacture of window-glass. Savoy House, in the Strand, was opened shortly after for the manufacture of flint-glass; but it was not till 1670 that the art of making the fine Venetian drinking-glasses, so much in request, was perfected. In 1673 a plate-glass house was established in Lambeth; but it was not till 1771 that plate-glass was manufactured extensively in Great Britain, in which year the British Plate-glass Company received its charter. The progress of the manufacture in this country, notwithstanding the obstructions offered by the excise laws, has been very decided. In 1845 glass was made free of duty; and at the present time the British manufacture is probably superior to any other in the world. In the year ending the 31st of December, 1855, the declared value of our exports of glass of British manufacture was—for flint-glass, £141,831; for window-glass, £33,821; for bottle-glass, £279,620; and for plate-glass, £52,283.

Glass is a compound of silica and an alkali, or metallic oxide, the silica acting the part of acid, and the alkali that of base. Silica is an abundant natural product; it forms an important ingredient in most rocks and stones, and exists separately in flint, agate, chalcedony, rock-crystal, and quartz. Potash, or soda, or mixtures of both, are the alkalies most commonly used. The combination of silica with potash forms silicate of potash, and with soda, silicate of soda. Silicate of potash with oxide of lead forms the three kinds of glass known as *flint*, *crystal*, and *strass*, but flint-glass contains more lead than crystal, and strass more than flint. The effect of the lead is to impart brilliancy and fusibility to silicates which might otherwise be infusible. Silicate of soda and lime, or silicate of potash, soda, and lime, form *common window*, *English crown*, and *plate glass*. Silicate of potash and lime forms *foreign crown* and *refractory Bohemian glass*, the presence of lime imparting hardness. Silicate of soda, lime, alumina, and oxide of iron, form coarse green wine-bottle-glass, the alumina imparting hardness, and the iron the dark colour.

In the manufacture of glass, the silica was formerly obtained by calcining and grinding flints, whence the name of flint-glass; but fine sea-sand is now used for the purpose, the sand being chosen as free from iron as possible, for this would colour the glass. It is cleaned by washing and calcining, after which it is sifted through lawn sieves. Carbonate of potash is prepared by refining American or Russian pearl-ash; soda is obtained by the decomposition of common salt, and is supplied by the chemical manufacturer. When a more than ordinary degree of whiteness is required, as in plate-glass, the soda is used in the form of dry carbonate; but for crown

and sheet-glass it is more commonly used in the form of sulphate, as it is obtained from the manufacturer of nitric acid, who produces it largely as a secondary product. Care must be taken not to employ too large a proportion of alkali in the composition of glass, or it will attract moisture from the air, or "sweat," as the glassmakers term it. The lead used in the manufacture of flint-glass, and which imparts to it softness as well as brilliancy, is in the form of litharge, or of red-lead. A small quantity of black oxide of manganese is also usually employed, the effect of which is to deprive the fused glass of colour arising from the presence of carbonaceous matters and protoxide of iron; for when the silicate of the protoxide of iron, which is of a green colour, comes in contact with one of the higher oxides of manganese, it takes away some of the oxygen from the manganese, and forms silicate of the peroxide of iron, which is nearly colourless, while the protoxide of manganese unites with silica to form a colourless silicate. The carbonaceous matters are also removed by the oxygen of the manganese uniting with them, and forming carbonic acid gas, or carbonic oxide. Borax, arsenic, and nitre, are also used in small proportions in the manufacture of glass; they are powerful agents, and require both care and knowledge in their application.

In fusing the glass-making materials, and retaining them in the liquid state, it is necessary to protect them from the action of smoke and flame, which would deoxidise the lead, in the case of flint-glass, and precipitate it in the metallic state, an effect which would also be produced by the various metallic oxides used to impart colours to glass. Hence, the materials for these glasses are melted in covered or hooded pots, sheltered entirely from the fire. Such pots are made of fire-clay, and one of them is represented in Fig. 206. The horse-shoe piece, shown near the base of the pot, is used for contracting its mouth when required. A number of such pots are arranged in a circular furnace, which is heated by the fire heaped upon the grate-bars B, Fig. 207, with a flue placed between



Fig. 206.

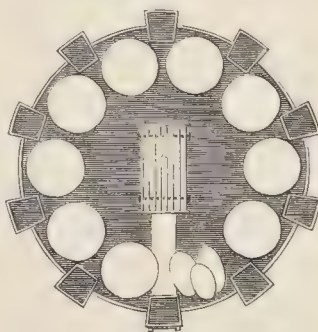


Fig. 207.—GROUND-PLAN OF THE SIEGE, FLUES, AND FIREPLACE OF FURNACE.

every two pots, while immediately abreast of each pot, and between every two flues, is an aperture, called the *working-hole*, which is used for introducing the raw materials, and getting out the glass. The appearance of the furnace may be judged of by referring to Fig. 208, which represents the interior of Mr. Apsley Pellatt's glass-house.

Flint-glass, at a certain temperature, is plastic, ductile, and flexible, so as to admit of being blown, drawn out, moulded, turned, and cut with scissors. The blowing tube is of iron, from 4 to 5 feet in length, with a bore of from $\frac{1}{2}$ inch to 1 inch in diameter. It is smaller at the mouth end than at the end which gathers the metal, as the glass-maker is accustomed to call the material on which he works. He also uses a solid rod, called a *pontil*, or *pontil*, for supporting the glass while working, when the blowing rod is no longer required. The *pucellas* B, Fig. 209, are made something like a pair of spring sugar-tongs, the prongs resembling the cutting parts of shears but blunt, and are used for rubbing the outside of

solid or hollow glass, and pressing it into a smaller diameter, while elongating the parts by rotation. This tool is also used to open or

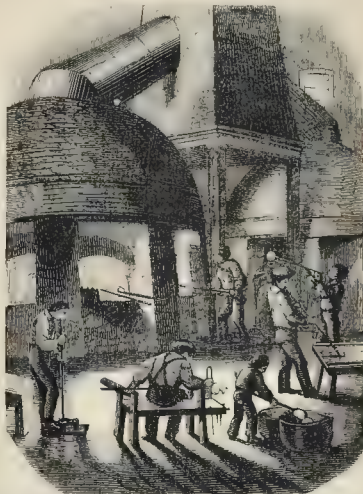


Fig. 208.—ELEVATION OF THE FURNACE, AND INTERIOR OF A FLINT-GLASS HOUSE.

close the insides of hollow vessels, and to shape the glass as it is rotated on the inclined planes of the chair in which the workman sits,

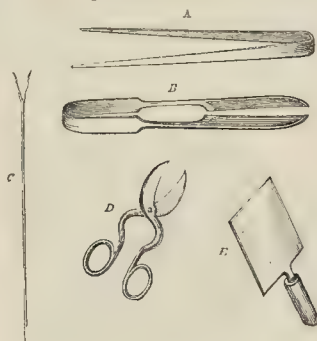


Fig. 209.

Figs. 208, 210. The spring-tool A, Fig. 209, is a kind of tongs for laying hold of half-formed handles, and for seizing the glass while



Fig. 210.—THE GLASS MAKER'S CHAIR.

making. The shears D are strong scissors for cutting off surplus glass, and for levelling the edges of the bowls of wine-glasses, &c.

The *battledore* E is used for flattening glass. The blower has also *compasses* and a *measure-stick*; also a slab of cast-iron, called a *marver*, supported on a wooden stand, on which to roll the glass, and give it a regular exterior surface. This is shown in Figs. 208, 210, and 213.

The art of the glass-blower is well illustrated by Mr. Pellatt's description of manufacturing a goblet, which consists, as so many articles do, of a bowl, a stem, and a foot. The blowing-iron, heated at the end nearly to redness, is introduced into the glass pot. Some of the metal instantly adheres to it, and the workman, by simply turning the iron round, can gather up as much as he requires. If this be a large quantity, the first gathering is taken out, and cooled by exposure to the air, and a second, third, or even fourth, gathering is made in succession on the same lump, the gatherings increasing in cubical proportions—viz., if the first be 8 oz., the second will be 4 lbs, the third, 16 lbs. For a wine-glass, the first small gathering is enough, as at a, Fig. 211, which represents a ball of

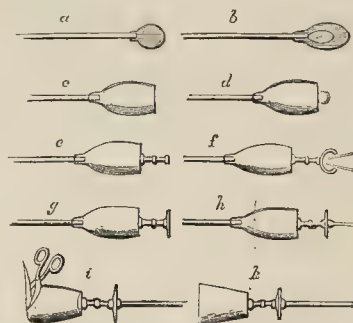


Fig. 211.

hot glass on the blowing-tube. This having been rolled on the *marver*, and expanded a little by blowing, assumes the form of b, which, being further shaped for the bowl of the wine-glass, and flattened with the *battledore*, is brought into the form of c. A small ball of solid glass is then attached to the flat part of the bowl, as at d, from which the stem is to be lathed or shaped with the *pucellas* while it is rotated up and down the inclined planes of the glass-maker's chair, which serves as a lathe. The stem thus shaped, as at e, is ready for the foot. The rubbing of the *pucellas* is not continued after the glass gets hard by cooling, otherwise the surface becomes excoriated. A globe, attached to the stem at f, is opened by the *pucellas*, and flattened into a foot, which is lathed and rapidly rotated on the arms of the chair to the form at g. A boy then gathers a small knob of glass upon an iron pontil, and attaches it to the foot, as at h. The blowing-iron is then wetted off at the dotted line in h by the touch of the cold *pucellas*, which cracks the glass, and it is disengaged by a smart blow of the *pucellas*. The edges of the glass have then to be sheared, as at i, and the finished glass k is then knocked off from the end of the pontil by a sharp blow, and carried to the annealing-arch on the end of a forked rod c, Fig. 209. The method of making a decanter with rings at the neck is as follows:—A gathering is made on the blowing-tube, as at a, Fig. 212, and swung wholly or partly round, until it assumes

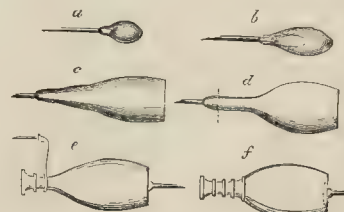


Fig. 212.

the form of b. It is further swung and expanded to c, and *battledored* to a flat end; it takes a more shapely form at d, when the

pontil is attached, and the blowing-tube is wetted off at the dotted line, and the mouth of the decanter formed. A man then gathers a small piece of glass upon a pontil, and drops it on that part of the decanter where a ring is required, as at *f*. The decanter is rotated until a whole circle or ring is formed and welded on to the neck, the surplus piece being torn suddenly away. The whole is reheated, rotated, and adjusted, by means of the pucellas. These tools, as used for fixing rings, differ from the common tools in having two dies affixed to the prongs, which, being pressed upon the rings while hot, give the required shape and size after reheating the decanter. A second and a third ring are next added, as at *f*. The brim is then finished, and the rings are well melted in, to insure safe welding and annealing.

Flint-glass bottles are formed by blowing glass into a brass mould. In making 8 oz. phials, for example, the man collects upon the end of his blowing-iron a sufficient quantity of metal for one bottle, and holding the rod vertically, gives it a slight jerk, which lengthens out the lump. He then marvers it, pinches the upper part with pliers to form the neck, places the hot glass in the mould, which is formed in two halves, and kept open by a spring. He pulls the two halves together with a string, as shown in Fig. 213,



Fig. 213.—MOLDING BOTTLES AND MARVERING.

and blows down the tube, when the plastic metal forms, as it were, a thin lining to the mould, and assumes its internal form. On relaxing the string the mould opens, and the phial is taken out adhering to the blowing-iron; it is wetted off, taken up on the end of a pontil, and finished off.

Articles in flint-glass are also formed by *pressing*, for which purpose a die is secured by a ring and handle; and the glass being gathered and dropped into it, a matrix or plunger is brought down, and presses the soft metal into the required form. Drops for chandeliers are *pinched* in twin brass dies, attached to handles, as in Fig. 214. The dies are furnished with steel wires, which pierce

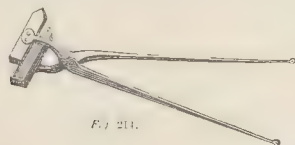


Fig. 214.

the holes for the brass wires by which the glass drops are united. Arms of chandeliers are also formed by pressing, but both they and the drops require to be cut and polished to produce the required brilliancy.

Glass, in whatever form it leaves the hands of the workman, requires to be annealed before it is fit for use, in order to get rid of that excessive brittleness which accompanies glass when quickly cooled. For this purpose, the articles, as they are shaped and finished, are put into what is called a *leap*, or annealing furnace, consisting of from two to four cylindrical arches, placed side by side, Fig. 215. The articles are arranged in iron trays, and are placed at that end of the annealing-arch where the temperature is just short of the melting heat of glass, and the trays are gradually

pushed forward, so that in the course of from six to sixty hours, according to the weight of the articles, they pass through a gradually decreasing temperature, and are fit for use.



Fig. 215.—THE ANNEALING-ARCH.

The brilliancy of flint-glass is enhanced by the operation of cutting, or giving to it facets and numerous angles, whereby it reflects and refracts the light in various ways, and produces that play of colour which we so much admire in precious stones. The cutting or grinding is performed by means of a cast-iron wheel, revolving in a lathe, above which is suspended a hopper, containing sand and water, which pours in a thin stream upon the rim of the wheel, see Fig. 216. On applying the glass to this rim, it is ground

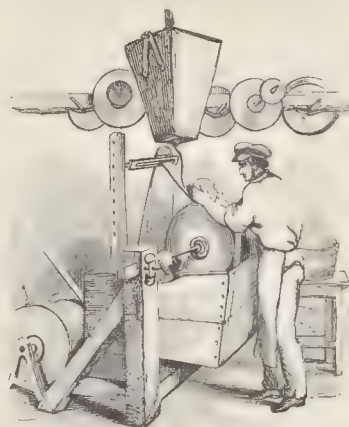


Fig. 216.—THE GLASS-CUTTER'S WHEEL.

away by the action of the wet sand. The marks of the sand are next smoothed out by means of a stone wheel with water, and it is polished on a wheel of willow-wood, first with a mixture of pumice and rotten stone, and then with putty powder. Engraving on glass is performed in the same manner as seal-engraving, by means of small tools rotating rapidly in a lathe.

Few artists require the guidance of good taste and artistic feeling more than the glass-cutter. The danger is that he will not distinguish sufficiently between those words of power, "enough," and "too much;" but will cut up the whole surface of the article into lines and facets, and various other ornaments, so as to obscure the contents of the vessel, although that vessel be of the most transparent substance produced by art. The great object of having glass vessels to hold the liquid portions of our food is to show the perfect cleanness and limpidity which we usually connect with purity. Hence, the water-jug, Fig. 217, is greatly to be preferred to the decanter, Fig. 218. The beauty of the one depends on its exquisite form, and the clear, hard, transparent material which embodies it, showing at a glance the nature of its contents. Were we disposed to be critical, we should object to the narrowness of the neck in a vessel which does not admit of a cover or a stopple, for with such an article in everyday use the very idea of the difficulty of cleaning the interior suggests that it is never cleaned. With respect to the

decanter, the artist, unmindful of the transparency of his material, has committed the great fault of over-ornamentation. Every part of the surface is covered with ornament, and that of a very com-



Fig. 217.



Fig. 218.

monplace description. The form of the stopple is ugly; but in order to judge of such articles fairly, they ought to be seen in glass rather than in wood-engravings, for the brilliancy produced by such elaborate cutting often allures the eye from defects of form. Some of the articles at the head of this chapter, Fig. 203, are in better taste, although they appear to be rather *tours de force* of the glass-cutter's art, than articles intended for domestic use.

A brilliant description of flint-glass, known as *strass*, is used in the manufacture of fictitious gems. It contains more oxide of lead than flint-glass, and also a small proportion of borax. When the materials are pure and well compounded, so as to be highly refractive and dispersive, the specimens, when properly cut and mounted, rival the diamond itself; and when, by the addition of various metallic oxides, colour is imparted, they are inferior to real jewels only in being softer, and consequently deteriorating by wear.

The most desirable properties of glass intended for ordinary use can be secured without much difficulty; but when required for optical purposes, for objects so remote or so minute that any distortion of the optical image prevents or disturbs the accuracy of the result, it is exceedingly difficult to obtain glass free from flaws, uniform in structure, unchangeable in colour, and of the proper degree of transparency and of refractive power. The chief difficulty in forming a homogeneous glass arises from the different densities of the various ingredients of the metal. Some fuse at a lower temperature than the others, and, sinking through the mixture, leave a streak or trail behind them; some evaporate or become decomposed at a temperature necessary for the fusion of others, and the ingredients do not all solidify at the same temperature. Hence arise a series of defects, such as discoloration, threads, globules, striæ, sweating, irregular crystallisation, all of which interfere with the perfect action of a glass lens. Some years ago a Swiss watchmaker, named Guinand, found that by a diligent stirring of the glass while in a state of fusion, together with a close attention to its composition, he was able to get rid of many of the irregularities in the structure of glass, and he succeeded, in conjunction with Messrs. Utzschneider and Fraunhofer, in making one of the largest telescope-glasses that had ever been constructed of so pure a material, namely, 9 inches in diameter, which glass is now in the observatory at Dorpat. This success was, however, restricted to flint-glass, for he did not succeed in making a homogeneous crown-glass, which requires the same perfection and the same dimensions as the flint. After the death of Guinand, M. Bontemps joined one of Guinand's sons in the manufacture, and succeeded in producing disks of good flint-glass of from 12 to 14 inches in diameter. About 1848, M. Bontemps accepted an offer from Messrs. Chance, Brothers, and Co. to unite with them in attempting to improve this branch of

the trade, and they succeeded in producing discs in flint of 29 inches diameter, weighing 2 cwt., and of crown-glass up to 20 inches. One great difficulty in producing such glasses is, that in annealing, the surface is liable to cool more rapidly than the interior, the effect of which is to produce a difference in molecular structure, and, consequently, an equal refractive action on the rays of light.

The glass in common use for window-panes is a silicate of soda and lime: it is much harder than flint-glass, and does not admit of being shaped into vessels, or ornamented by cutting and grinding. It will bear considerable exposure to the weather, and yet be sufficiently transparent and so regular in its surface as not to distort objects seen through it. It is made in the form of flat discs or tables, 52 inches in diameter; but Messrs. Chance have formed tables of 66 inches. Glass is also formed in cylinders, whereby larger panes can be produced. The glass-pots, Fig. 219, are open



Fig. 219.—CROWN-GLASS POT.

at the top, on account of the greater heat required; the materials are fritted or calcined before being vitrified, to prevent the alkali from being volatilised in the furnace. About 18 hours are required for vitrification; and when the glass is clear, and the *glass-gall*, or infusible earthy impurities, have been skimmed off, the metal is ready for working. The man collects on the end of his blowing tube as much glass in successive layers as will form a disk or table of about 9 lbs. weight. He marvers this into a pear-shaped lump, *a*, Fig. 220, while a boy slightly distends it by blowing. It is then



Fig. 220.—PROCESS OF THE MANUFACTURE OF A TABLE OF CROWN-GLASS.

softened in the mouth of a small furnace, called a *blowing-furnace*, from its use in enabling the man to blow the glass into a large globe. It is again marvered, in order to distribute the thickness properly, and to collect the great mass of the glass at the lowest point, or at the end of a neck of glass, as at *b*. The outer extremity is made during the marvering into a conical end, called the *bullion*,

which is rested upon a smooth iron rod, called the *bullion-bar*, and is further distended by blowing, as at c. In some cases the bullion



Fig. 221.

is supported by a tube, held by a boy, but in either case the glass is made to revolve while being distended by blowing. The sphere being properly formed, is exposed to the direct action of flame at what is called the *bottoming-hole*, Fig. 221, the wall partly built in front screening the man from the flame. The hook projecting from the wall serves to support the blowing-tube, by revolving which the globe, under the united action of heat and centrifugal force, assumes the form shown at d, Fig. 220. The glass is now transferred to a pontil by dipping the iron rod into melted glass and applying it to the centre of the flattened part of the glass. At the same time the man detaches the blowing-iron by touching the neck of the glass with cold water, leaving a hole in the glass, as shown at e, Fig. 220. By holding the glass before a moderate flame, and causing it to rotate with gradually increasing velocity, the flattened sphere becomes more flat, and the hole larger. The glass is now heated before the flashing-furnace, Fig. 222, when, by causing it to

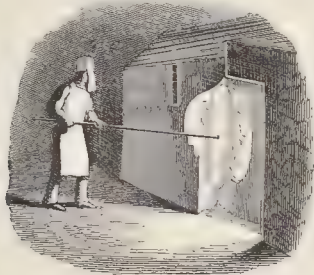


Fig. 222.—THE FLASHING-FURNACE.

rotate with greater speed, the flattened globe at length flies open with a noise something like that produced by quickly opening a wet umbrella, and forms a flat circular disk from 50 to 60 inches in diameter, of uniform thickness, except where the glass is attached to the pontil, where there is a swelling, called the *bull's-eye*.



Fig. 223.

The man continues to whirl the table until it is sufficiently hardened by cooling to support itself without folding together, when it is placed on a large iron fork, held by an assistant, the pontil is cracked off, and the plate is transferred to the annealing-arch, Fig. 223, where it is made to rest on edge in two parallel iron supports, running the whole length of the kiln, which is of sufficient capacity to receive two rows of tables, as shown by the dotted circles. The annealing is continued for 24 hours, during which the whole arch is raised to a uniform temperature, which is gradually let down.

The objection to glass in tables arises from the waste in cutting consequent on the circular form, and from the knob or bull's-eye in the middle, so that it is impossible to procure from them panes of greater superficial measurement than about one-third of that of the tables themselves. On the continent of Europe crown-glass is made on a different principle; the glass is first formed into a cylinder, closed and rounded at both ends, which are then cut off, and a crack being run down the length, or the cylinder itself attached to a three-pronged pontil, is cut open with shears, as shown in Fig. 224. The cylinder is then conveyed to a furnace, where it is flattened out.

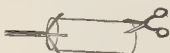


Fig. 224.

The glass thus formed is coarser in texture, more wavy and dull than glass formed in tables, but it allows of larger sheets being manufactured. Some years before the opening of the Great Exhibition of 1851, the method of making *cylinder-glass*, or *spread-glass*,

and *broad-glass*, as it is called, was introduced into this country,* but for which the existence of the Crystal Palace would have been impossible. This subject belongs so peculiarly to the *Crystal Palace Expositor*, that we will dwell a little upon its history.

There is evidence to show that the cylindrical process was in use about the end of the twelfth century. The plan was employed among the Venetians for their coloured glasses, which could thus be made more uniform in colour and in thickness than by the other method. As the demand for coloured glass declined, the plan went out of use, and glass long continued to be made on the rotatory principle. Bohemia, however, which, as has been already observed, still retains the traditions of her first teacher, did not abandon the cylindrical process, but practised it with so much success that, when glass of unusually large size and good colour was required, Bohemia was called upon to supply it. France, as a glass-making country, beheld this superiority with impatience, and at the commencement of the eighteenth century attempted to share in it, by establishing a manufactory at Lettenbach, on the borders of Lorraine and Alsace. The works were carried on by artisans from Bohemia, under the direction of a French officer, named Drolenvaux. The company had established themselves on land belonging to the Monastery of St. Querin, under a lease for 100 years, and the title of *Manufactory of St. Querin*. The numerous factories of cylindrical glass in other parts of Europe owe their origin to these works.

The Bohemian workmen, who had been induced by high wages to establish themselves at St. Querin, determined, if possible, to preserve their privileges, by forming a close league to keep their art and mystery strictly confined to their own families. They would not allow any stranger to enter, either as apprentice or workman; and when attempts were made to this effect, they struck work, and threatened to abandon the factory, a proceeding which in a glass-house would entail ruinous consequences, for it is necessary to keep the fires constantly burning, to prevent the glass from becoming solid, and the pots from being ruined. This workmen's league long continued to operate—the son followed the trade of his father, and the grandson had no higher aim; indeed, at the present day, men employed in the various glass-houses of France show their German origin by such names as Schmidt, Zeller, Theber, Stenger, Huy, Mayer, &c. A somewhat similar practice has prevailed in England, the glass-makers' trade being a very exclusive one. The men form themselves into benefit societies, and watch with great jealousy the introduction of strangers into the trade—a circumstance which has proved injurious to it, by interfering with that development consequent on freeing glass from the trammels of the excise laws; and there is probably no country in the world better qualified to produce unlimited quantities of glass than our own. We have the raw material abundant and cheap, and the fuel, which is the grand item of expense in a glass-house, we have in abundance also.

The production in this country of cylinder-glass of large size was called for by the improved state of horticulture, which required

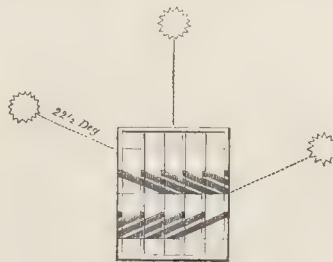


Fig. 225.

larger houses for the plants, and more light. Mr. Paxton describes the forcing-houses at Chatsworth, in 1828, as being formed of coarse thick glass and heavy wood-work, which made the roofs dark and gloomy. The evil was mitigated by bevelling off the sides of the rafters and sash-bars. There was also an objection in the construction of glass-houses; in plain lean-to or shed-roofs the morning and

* Properly speaking, *spread-glass* or *broad-glass* had been made in England long before on the cylindrical principle, but it was of very inferior quality, and of small size.

evening sun presented its direct rays at a low angle, and consequently very obliquely to the glass, when most of his rays are obstructed by the position of the glass and of the heavy rafters, as shown in Fig. 225, and much of the benefit arising from the influence of the morning and evening sun is thus lost. An attempt was made to obviate the objection by placing the glass more at right angles to the oblique rays. This led to the adoption of the ridge

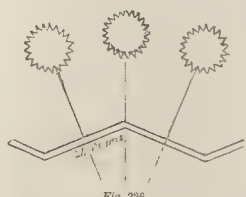


Fig. 225.

and furrow principle for glass roofs (Fig. 226), which places the glass in such a position that the morning and evening rays enter the house without obstruction, and present themselves more perpendicularly to the glass at those times when they are least powerful; while at mid-day, when they are most powerful, they present themselves more obliquely to the glass. In introducing a lighter sash-bar, it was desirable to get rid of the numerous overlaps connected with the old system of glazing in short lengths, and we have now to refer to the efforts of Messrs. Chance and Hartley, of Smethwick, near Birmingham, who, during a visit, in 1830, to the manufactory of M. Bontemps, of Choisy-le-Roi, near Paris, were struck with the advantages attending the manufacture of glass on the cylindrical principle. About this time the revolution had rendered society unsettled in France, and M. Bontemps agreed to co-operate with Messrs. Chance in introducing the method into England. Their first furnace was started in the autumn of 1832, but many difficulties had to be overcome before the glass made its way in the market, among which was the heavy excise duty upon window-glass. In 1836 the partnership was dissolved, and Mr. Hartley established a manufactory for crown-glass at Sunderland. The waviness of the surface was a great obstacle to its general introduction; and it was not till 1838 that Messrs. Chance, Brothers, & Co., succeeded in obtaining a thick glass with a good surface. The removal of the excise duty led to many improvements—panes 4 feet in length were produced for horticultural purposes; and at the time of the Great Exhibition panes somewhat larger even than this were manufactured for the Exhibition building—a size which, as it was remarked at the time, no country but England could have furnished any large quantity.

In the formation of cylindrical-glass, the workman collects a large ball of molten metal at the end of his blowing-tube, pushes it forward so as to form a groove, *a*, Fig. 227, marvers it, slightly distends it by blowing, as shown in section in the same figure, and from the thick mass of glass below the air-bubble distends and lengthens out a cylinder, the glass being first made to assume the width, and then the length of the intended cylinder. The ball of glass having been heated, the man holds it up over his head,

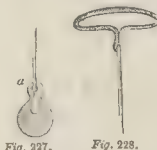


Fig. 227.



Fig. 228.

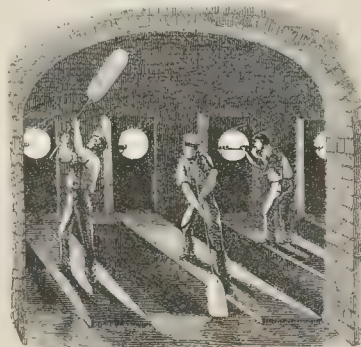


Fig. 229.—BLOWING AND SWINGING CYLINDER-GLASS.

and blows into it, when the plastic material, yielding to the distending force of the air, and to gravity, forms a kind of flattened

bottle; Fig. 228. In this way the required width of the intended cylinder is attained. The man then quickly lowers the glass, and swings it backwards and forwards (Fig. 229), blowing into it all the time. The thick bottom retains its heat much longer than the thin sides, and, yielding to the two forces, increases in length, and assumes the form shown in Fig. 230. The blowing without the swinging would produce the form indicated by the dotted line. The glass is again heated, and, by repeating the swinging and the blowing, the length of the intended cylinder is obtained, as shown in Fig. 231. The glass is next opened at the point *c*, which is now the thinnest part; this is done by blowing air into



Fig. 230.



Fig. 231.



Fig. 232.



Fig. 233.

the vessel, closing the blowing-tube with the thumb, and holding the end *c* in the flame of the furnace, until the vessel bursts at that part from the increasing elasticity of the enclosed air. The margin of the aperture is trimmed with scissors, and enlarged with the pucellas to the proper diameter, as shown in Fig. 232, and when brought to the form of Fig. 233, the neck or cap is removed by supporting the cylinder on a wooden rod, and turning the upper part two or three times in the curve of a bent iron, heated to redness, as shown in Fig. 234;



Fig. 234.



Fig. 235.

the heated part, on being wetted, causes the separation of the cap, a crack being also run down the length of the cylinder; the glass is in the form shown in Fig. 235, and is ready for spreading or flattening. This operation is performed in a furnace, the chief arrangements of which are shown in Fig. 236: *a* is the ash



Fig. 236.—FLATTENING-FURNACE.

pit, *r* the grate, *b* the ash-pit-door, and *d* the stoke-hole. The flame enters the upper part of the furnace through the openings *e*, and first plays on the *flattening-hearth* *c*. It then passes into the annealing or cooling-furnace *B*, and escapes by the flue or channel *D*, by which the cylinders are introduced. *C* and *B* are connected by means of an arched aperture at *E*, which allows the passage of the glass plates, and also by a smaller higher opening *G*, which admits the flame. The heat is regulated by opening or closing the aperture *c*; the man who flattens out the cylinders stands in front of the aperture *l*; the man at the annealing-furnace before *m*, and an assistant pushes the cylinders forward along a railway into *D*. The spreading-plate or flattening-stone must be perfectly smooth and even: it is sometimes made of fireproof-clay, mixed with cement, and ground smooth, or it may be a thick plate of devitrified glass.

Some kinds of sandstone have also been found to answer the purpose, such as that of Godstone, in Surrey. The spreading is commenced by introducing the cylinders into a long flue leading into *b*, and as they are pushed forward they gradually soften. The flattener, standing before the aperture *l*, takes up one of the cylinders with an angular tool, places it on the flattening-stone with the cracked side uppermost: the cylinder soon opens, and the man makes it straight and even with a piece of wood attached to an iron rod (Fig. 237), the wood being dipped in water previous to use. The



Fig. 237.

curves and lumps being flatted out, the sheet is pushed into the annealing-oven, where it cools down sufficiently to be placed on edge in an inclined position; and when 30 or 40 sheets have thus been collected, an iron rod *s*, Fig. 236, is inserted.

English manufacturers have introduced various improvements into the above method of making cylindrical glass. Messrs. Chance, instead of at once removing the glass from the flattening to the annealing-furnace, and lifting it to the cooling-bed while soft and liable to distortion, flat and cool it by passing it through a succession of decreasing temperatures, so that it is not lifted up until it becomes rigid. By this means the flattening can proceed simultaneously with the annealing, which cannot be done according to the previous arrangement, since the temperature of the annealing-kiln must be greatly reduced; and as this is contiguous to the flattening-kiln, that must also be let down much below the working-point. Mr. Hartley has improved the process by making the flattening-stone revolve in such a way that the cylinder upon it is gradually exposed on all sides to the action of the fire, so that one part be not hotter than the other; and as it is difficult to obtain perfectly flat glass for polishing, on account of the film of air between the flattening-stone and the plate, the flattening-stone is perforated with holes $\frac{1}{2}$ inch in diameter, and about 1 inch apart.

The beautiful variety known as *plate-glass*, for which this country is so celebrated, is similar in composition to crown-glass, the only essential basis with silicic acid being soda and lime; but a larger proportion of alkali being used, the point of fusion is lower than in crown-glass. Plate-glass should be transparent and colourless, especially when used for mirrors, and there must be no waves or lumps to produce irregularity of reflexion.

The materials for plate-glass must be carefully selected, and purified from oxide of iron, sifted and ground. A small portion of nitre is sometimes used for getting rid of carbonaceous matters, and arsenic and borax are also used to improve the colour. The materials are melted in open pots, and by the side of them are crucibles or *cisterns*, Fig. 238, into which the glass is ladled when ready for casting. The cisterns hold from 3 to 6 cwt., and have an indented ring, about one-third of the way up from the bottom, into which the limbs of tongs fit. Vitrification is complete in about 20 hours; and when the glass-gall is removed, a copper ladle, supported by an iron rest, held by two men, is plunged into the glass-pot, raised full of melted glass, and poured into the



Fig. 238.

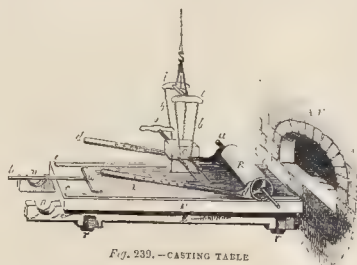


Fig. 239.—CASTING TABLE

cistern, which, being in this way filled, is left for 12 hours to fine. The casting is performed on massive tables of metal (*r*, Fig. 239);

and when everything is prepared for the purpose, the cistern is taken out of the furnace, placed on a low carriage, and removed to the casting-table. The glass is skimmed with a broad copper sabre, and the cistern being scraped on the outside, is wound up to a sufficient height by means of a crane, and swung over the upper end of the casting-table, when, being tilted over, an avalanche of melted glass pours down, and spreads over the metal surface, ribs of metal *cc* at the side preventing it from overflowing, while a massive copper roller *r*, Fig. 239, is set in motion, and spreads the glass out into a sheet of uniform breadth and thickness. The effect of this operation is exceedingly beautiful—a variety of prismatic colours play over the surface of the plate after the roller has passed over it. Being itself a sort of temporary sun, it lights up the spacious hall, and brings out the individuals and all the details of the locality, while the floods of heat which pour from it are painfully felt, and show the necessity for the high roof and the iron sheeting placed under it, 30 or 40 feet above the casting-table. To remove all impurity from the casting-slab, a washer *w* is drawn immediately in front of the fluid glass; the excess of glass, if any, pours over the front edge into a trough filled with water; the roller then passes off the slabs, and is received in the groove *nn*. The casting is then cleared of any redundancy at the sides; a thick flange is turned up at the end *cc*; and, when this has become rigid, an iron rake is applied to it, and the plate is forced forward into the annealing-oven *A* *r*, or it is thrust upon a wooden platform moving upon wheels, by which it is conveyed to the oven, where it remains about five days. The plates thus formed are about $\frac{1}{2}$ inch thick, of an irregular mottled appearance; they are examined to see whether the glass is sufficiently free from defects to be formed into large plates, or whether the plate must be cut up into smaller portions. Having been squared, the plates are next ground and polished. The first object is to produce a level surface, which is done by grinding one plate upon another by means of appropriate machinery. Sharp river sand, washed and sifted into three sizes, being used with water as the grinding material. The plates are then reversed, and the other sides are ground. When the plates are sufficiently smooth to require the application of emery the surfaces tend to cohere, so that when travelling even with moderate velocity, one surface is liable to tear the glass from the other. Hence the next process, namely, the smoothing, is usually done by hand. The plates are put upon flat stone benches covered with wet canvas, and the surface being sprinkled with emery and water, a small plate, used as a runner, is moved over it with a peculiar eccentric motion. Three sizes of carefully washed emery are used; the plates, canvas, bench, and hands being carefully washed between every two sizes. The fine emery last used gives a very smooth and partly polished surface; the polishing is completed by rubbers covered with thick felt, and worked by machinery, Venetian pink being the polishing powder. By means of grinding and polishing the plates are reduced in thickness from one third to one half. The plates are now carefully examined, the defective ones are cut up into smaller plates, while the more perfect ones are reserved for silvering.

The silvering of glass consists in the application of an amalgam of tin to the surface of the glass, for which purpose a sheet of tin-foil of larger dimensions than the plate to be silvered is spread out upon the silvering table, and mercury is brushed over it. When the surface is uniformly covered, more mercury is added, so as to attain a height of two or three lines. The film of impurities which covers the surface is removed with a wooden rod, and the whole made bright and resplendent. The plate of glass is then pushed slowly forward, with the longest edge foremost, and dipping below the surface of the mercury so as completely to exclude the air. The glass is thus brought into contact with the metal, and a brilliant surface is produced. The excess of mercury is got rid of by loading the mirror with iron weights, and inclining the silvering table ten or twelve degrees. After this the plate is set up on edge, and in the course of three or four weeks the coating of tin amalgam becomes dry.

Another method of silvering is by mixing ammonia with nitrate of silver, filtering the mixture, and adding to it an alcoholic solution of oil of cassia. On the addition to this fluid of a reducing liquid, consisting of an alcoholic solution of oil of cloves, a brilliant metallic silver film is deposited, which attaches itself firmly to the surface of the glass. The effect, however, is not quite satisfactory; it is not easy to obtain a perfectly clear, unspotted surface, and the mirror has a certain black effect, arising from the close texture of the

metal, and its perfect adhesion to the glass, so that it reflects the rays of light with such precision that very few of them reach the eye, unless the angle of incidence be very small, as when a person is standing opposite, or nearly opposite the mirror. The ordinary coating of tin amalgam is, on the contrary, crystalline, the effect of which is to scatter the light, and reflect it to the eye in almost any position in which the observer may be placed. One advantage of the silvering fluid is that irregular surfaces—the interior of glass balls, &c.—admit of being easily silvered. Figs. 240, 241 represent a centre dish and a vase of glass, silvered by Mr. Hale Thomson's process. They are from the establishment of Mr. Mellish, of London.



Fig. 240.

The French have long been celebrated for the excellence of their plate-glass, and the beauty of their mirrors. Compared with English plate, the quantity of French plate annually produced is small. Our custom of glazing windows with plate-glass—extending as it does to



Fig. 241.

shops of every description in the commonest neighbourhoods of the metropolis, and in most country towns, to say nothing of the number of looking-glasses, large and small, which are to be found in every house—requires an enormous production of this beautiful material.* The French, on the contrary, manufacture chiefly to suit the taste of the upper classes; and, the manufactories having been accustomed to government support, there are thus two powerful reasons why the manufacture should flourish rather as a fine art than as a commercial speculation. On comparing specimens of the best French with English plate, by placing them side by side, and viewing some distant object in each by reflexion, the French glass will give a clear, sharp outline, while the English will reflect two or more images in a hazy and imperfect manner. One reason for the excellence of the French glass is to be found in the care with which the materials are selected and combined, the plate-glass of St. Gobain being, it is said, a true chemical compound, consisting of

one atom of tri-silicate of soda, and one atom of tri-silicate of lime, with a small percentage of alumina. English plate, on the contrary, consists of a mixture of two glasses of different densities, produced by want of attention to the atomic relations of the components. Now, it is a remarkable fact that a mixture of certain bodies produces by fusion a compound more easily fusible than any one of the components separately. Thus, carbonate of potash and carbonate of soda, when mixed atom for atom, form a compound more easy of fusion than either alkali alone. So also fluorspar and sulphate of lime, two remarkably infusible substances, melt readily, when mixed at a low red heat, into a mobile transparent fluid. So also, in the case of the silicates, a mixture of silicate of potash and silicate of soda, if in atomic ratios, fuse much more readily than either one of them alone; but, if one of them be in excess, the silicate of soda, for example, then the silicate of potash unites with exactly sufficient of the silicate of soda to produce a glass of comparatively easy fusibility; while the less easily fusible silicate of soda in excess forms a kind of net-work throughout the mass, and, being thus entangled in the more fusible glass, and having a different density, form striae, and produce unequal refraction, and consequently distortion of figure.

The origin of the celebrated French works of St. Gobain is intimately connected with the present method of making plate-glass

* The Thames Plate-Glass Company, established in 1835-6, at Blackwall, produces enormous quantities of plate-glass. Two other works, in Lancashire and at Smetwick, produced in 1851 upwards of two millions of square feet annually, which was used first in the shape of rough plates for glazing, for roofing in railway-stations, for skylights, and similar purposes; secondly, as polished glass for shop-windows, and large plates for the windows of houses.

by casting. The cylindrical process had previously been adopted, and was introduced into France in 1665, under the patronage of the minister Colbert; and the works established at Tourlaville, near Cherbourg, were aided by a grant of public money. The works had not been long in operation when Abraham Thevart, a working manufacturer, discovered the method of producing plate-glass by casting. He obtained a patent for his invention for thirty years, and established works in the Faubourg St. Antoine, at Paris, where plates were cast of the then extraordinary dimensions of eighty-four inches by fifty—a size which excited the greatest surprise and admiration. The expense of carrying on the works at Paris being too great, they were removed to St. Gobain, in Picardy, where the new company met with considerable opposition from the old company of Tourlaville. Thevart was bound by his patent not to cast any plates of less dimensions than sixty inches by forty. The largest plate formed by the cylindrical process did not exceed fifty inches in its largest dimensions. In 1695, the two companies endeavoured to settle their disputes by uniting under a common charter of incorporation; the union was not a happy one—the company rapidly declined, and, in two short years, became insolvent. On the ruins of the old company a new one was formed, under the management of Antoine d'Agincourt, who re-kindled the furnaces, re-engaged the discharged workmen, and, by prudent management, caused it to prosper. The company of St. Querin was not slow in combining the art of casting with the cylindrical process, which they had first introduced into France. Previous to the expiration of their lease from the monks of St. Querin, they had taken the precaution of forming another establishment at Cirey, near St. Querin, into which the manufactory of the latter place merged. The two great establishments of St. Gobain and Cirey long continued to oppose each other; but, on the appearance of a third company, they adjusted their differences, established a common



Fig. 242.

depot for the sale of their wares, and agreed as to their price in different markets. The specimens of glass from both manufactories sent to the Great Exhibition are described in the Jury Report, Class XXIV., as being pure in colour, excellent in structure, finish, and polish, and free from globules and other defects; "in short," it is added, "the produce of these manufactories, now exhibited,

approaches as near to perfection in this branch of the manufacture as it can attain." As a specimen of French taste in mounting mirrors, we select a toilette-glass, Fig. 242, by M. Rudolphi, of Paris.

The coarsest variety of glass that is manufactured is known as bottle-glass, the materials being soap-boilers' waste, and common river or sea-sand, such being required by law for wine and beer-bottles, when the duty thereon was only $\frac{1}{4}$ th that of flint-glass. The theoretical composition of bottle-glass is a triple silicate of soda, alumina, and lime; but a portion of the lime is generally supplied by magnesia and protoxide of iron, and a portion of the alumina by peroxide of iron. The alumina is in the form of clay. The raw materials are first fritted, and then vitrified, a very high temperature being required for the purpose on account of the small proportion of alkali. In about eighteen or twenty hours the vitrification is complete; the glass-gall is skimmed off, and the temperature of the furnace is lowered, so that the glass may become sufficiently viscid for blowing. Wine bottles are formed in cast-iron or brass moulds, as in the case of flint-glass bottles. Wine-bottles require care, not only as respects the choice of materials, but also in the blowing. If the lime or other alkali of the bottles be in excess, or not chemically combined, and the wine be of an acid character, the bottle will be slowly disintegrated. Glass bottles are sometimes fraudulently made in England with an excess of alkali, which may be readily acted on by the tartaric acid of wine, and quickly form a crust, which will adhere more firmly to the glass than in the case of ordinary bottles. The bottles used for effervescing wines must be of equal thickness throughout, so as to be able to resist the bursting pressure. It is stated that in the champagne trade the loss of bottles from bursting amounts to from twenty to thirty per cent; and it is now customary to prove the bottles by a machine which imparts an internal pressure of from twenty-five to thirty-five atmospheres.

Passing from the coarsest glass to the finest, we must now refer to some of the varieties of ornamental glass, which may be seen in the Glass Court, and in other parts of the Crystal Palace, including coloured glass, and paintings on glass. Many varieties of ornamental glass are due to the Venetians, and are from time to time revived and brought out as novelties. Such are the *Venetian ball*, which consists of a number of pieces of filigree glass packed into a pocket of transparent colourless glass, which is adhesively collapsed upon the interior mass by sucking out the air, so as to allow the atmospheric pressure to act upon it. *Venetian filigree* consists of plain and coloured enamel. Canes, or sticks of glass, are arranged round the interior of a mould, transparent flint-glass is then put in, so as to form a ball with the canes adhering to it. The ball is then heated, marvered, and covered with a gathering of white glass, after which the whole is worked into a vessel, after the manner described for making a wine-glass, or other article in flint-glass. Spiral stems for wine-glasses, &c., are sometimes made in a similar manner. *Millefiori glass* is formed by fusing together a number of tubes of various colours, together with sections representing stars, flowers, &c., slices of which are imbedded in white transparent glass, forming an ornamental letter-weight. This manufacture has recently been revived; but in many cases the patterns are quite devoid of taste. *Mosaic glass* is produced by small rods of variously coloured opaque or transparent glass of uniform length, arranged so that the ends may form patterns. By cutting off slices at right angles to the length the pattern may be multiplied. *Smeltz glass* is formed by fusing lengths of coloured glass into each other, so that the section may resemble carnelian and the agates. *Vitro di trino* is a kind of lace-work formed by intersecting lines of white enamel, or transparent glass; the centre of each mesh being occupied by a bubble of air. *Frosted glass* is formed by plunging the vessel, after it has been blown, while still hot, into cold water, then re-heating and re-blowing it, the effect of which is to make it appear as if covered with fractures. *Aventurine glass* has a brownish colour, and is interspersed with small spangles, which give it a peculiar shining appearance. It may be prepared by fusing together a mixture of 300 parts pounded glass, with 40 parts of copper scales, and cooling the mixture slowly, when the copper becomes diffused through the glass in octohedral crystals. Mr. Pellatt has invented a method of ornamenting glass with delicate white argentine incrustations of dry porcelain clay, cemented into the solid glass. The figures, made quite dry, are placed on a red-hot bulb of flint-glass, and covered with a thin layer of very fluid glass, in which state it may be worked into the vessel by placing it

in the mould in which the glass is blown. The white figures have a silvery appearance; but coloured enamel figures are also used.

There is yet another description of glass to which the Crystal Palace is indebted for some of its most charming effects, and which, during several centuries past, has formed a most important feature in religious edifices, where—

"Storied windows, richly dight,
Casting a dim religious light,"

have given the finishing touches to those Gothic interiors which wanted but this to render them worthy of their architects:—

"They dreamt not of a perishable home
Who thus could build."

During the twelfth and thirteenth centuries, the art of glass-painting flourished, as it were, under the very shadow of barbarism, when, whatever appreciation of artistic beauty existed, belonged to or was appropriated by the church. In the fourteenth and fifteenth centuries this art reigned supreme. In the sixteenth we see it engaged in a struggle with its formidable rival, oil-painting, and, as if the world of art had not space enough for the two, glass-painting yielded, and would have sunk into oblivion, but for the variegated monuments of beauty which the windows of nearly every church in Europe constantly presented to the eye. The practice of adorning the interior of churches with oil-paintings led to the necessity, real or supposed, of throwing upon them the pure light of heaven, instead of straining it through the splendid palette of the glass-painter; and hence it was that the two arts were supposed to be incompatible, and that of glass-painting fell into desuetude, and did not begin to revive until our own day. As it is not the practice to admit oil-paintings into Protestant churches (indeed, the bench of bishops, at the request of George III., considered the matter, and decided that it would not be proper to introduce such a practice), there can be no good reason why this glorious art, this unrivalled method of relieving the baldness and monotony of our ecclesiastical interiors should not become more and more common. A little of the money which has been lavished in collecting the stone quarry of marble clouds and stone seas, which disfigures the nave of Westminster Abbey, or has been wasted, shall we not say, on the meaningless statues, pedestals, and pyramids which mar the beauty of most of our Gothic interiors would, if expended on painted-glass windows, have given the finishing touch to those marvels of architectural beauty and dignity which continue, age after age, to instruct and delight mankind.

The old painted glass is as characteristic of the time which produced it as are the mullions or tracery of the windows which it adorns. In the earlier forms we have lively colours distributed after the fashion of a mosaic—"a rich carpet, whose simple, but graceful pattern is illuminated in alternate gradations of colour admirably combined."* The artists "began their work by running round the edge a rich border of colour, fringing the outside, and forming a distinct and glowing enclosure for what came after. They then proceeded to cross with bands of colour the clear space left between, dividing it into compartments with panelled shapes of strongly defined form, squares, lozenges, and circles, in every combination and variety. The principal lines of these were confirmed by the stout iron-work to which the glass was attached; and, in all early glass, these bands and divisions form a prominent feature, and give an air of arrangement and solidity which the width and extent of the spaces might render difficult with any other treatment."† The earlier examples consist of pieces of glass of various colours symmetrically arranged, the art of drawing lending but little assistance. But as this art came to be appreciated, and applied in other departments, we see it extending its marvellous effects to glass-painting. In the windows of the sixteenth and seventeenth centuries is introduced what may be called the historical era; and

* *Art of Painting on Glass*, published in Weale's Rudimentary Series. This work professes to be a translation from the German of Emanuel Otto Fromberg; but, in the *Encyclopædia Roret*, the same matter is included in a manual by M. E. F. Roboulet, de Thoirs, entitled *Nouveau Manuel Complet de la Peinture sur Verre*. Paris: 1844.

† *A Pica for Painted Glass, being an Inquiry into its Nature, Character, and Objects, and its Claims as an Art*. By Fras. W. Oliphant. Oxford, 1855. We have great pleasure in referring to this pamphlet, which gives within the compass of a few pages a clear and eloquent statement of the claims and pretensions of glass-painting as a distinct branch of art. It is easy for a more writer on the subject to appear to be learned, authoritative, and critical: Mr. Oliphant, without any such assumption, speaks feebly and well of the art which he practices with so much success.

it was the object of the artist to make each window bear a lasting testimony to the eye of that which the fasts and festivals of the church addressed to ear and heart. But another change comes over the art of glass-painting. The colours become more brilliant, more diversified, and the interior of many a chapel dazzles with the splendour of innumerable jewels in the light of the sun. Larger figures are now introduced, drawn with greater skill; the figures are surrounded with splendid borders, or friezes; thus the design becomes more elaborate, until we have architectural backgrounds, and imitations of the antique. In the eighteenth century the art may be said to have been lost, so little was it practised. In modern times, when men sought this form of the beautiful to add grace and dignity to their churches, or when the piety and affection of survivors led them to raise memorials to their friends in this beautiful material rather than in stone, the dexterity of the old workers could not be at once commanded, nor were artists ready with suitable designs. These latter fell into the mistake that it was necessary to imitate, and even to rival oil-painting, forgetting that they had to deal with a material possessing properties peculiarly its own, among which must be specially noticed the transparency, or, rather, translucency by which it addresses the eye, by means of light coming from without to the spectator within through the picture itself. In oil-painting, on the contrary, the material on which the painting is made being opaque, all the colours, many of which are opaque also, must be viewed by reflected light, and from a moderate distance, so moderate, indeed, that the artist can introduce minute details, and blend his colours with so

much delicacy and harmony as to run into each other—to melt into those imperceptible gradations which form so much of the loveliness of nature. But, in a painting on glass, the distance at which it is seen being ordinarily considerable, minute detail cannot be appreciated any more than gradation of colours, for, however delicately and harmoniously the half-tints may be arranged, they run into each other, and appear at a distance to be of only one colour. This fact is so important that it ought to be uppermost in the mind of the designer on glass, and to regulate all his proceedings. The great merit of the old specimens of stained glass lies in their originality; their designers did not condescend to borrow from other arts, but presented boldly the peculiarities of their own art; and, if they received suggestions at all, they obtained them from Nature, the great parent of all the arts. Moreover, the lead-work and iron bars which unite the different parts of a painted window, and which cannot be entirely concealed in the shadows, must entirely prevent any resemblance to oil-painting, should the glass-painter not rise above the low ambition of being a mere imitator; indeed, the method of mounting the glass-picture constitutes one of its essential features, which the earlier artists, so far from attempting to conceal, brought prominently forward.

In carrying out the mechanical details of the art, the moderns failed in some cases to produce that brilliancy of tone and purity of colour for which the best ancient specimens were remarkable. Then originated the statement

—made by persons who look with mistrust on all modern attempts to reproduce the works of some favoured period—that we are a degenerate race, that the ancient art is lost, and that it is in vain



Fig. 243.—ST. MICHAEL CASTING OUT THE GREAT RED DRAGON.
(By the St. Helen's Glass Company.)

to seek to revive what is gone for ever. To such detractors we may relate an anecdote of what fell under our own notice a few years ago. Previous to the erection of that magnificent pile of Tudor architecture in Lincoln's Inn, the architect, in explaining his

working drawings to the builder, advised him to spend a day at Hampton Court, and study the mode in which the artisans worked in the time of Elizabeth, "for," said he, "that is the sort of effect I wish to produce." The builder paid his visit, and, on his return, said to the architect, "It cannot be done."—"What do you mean?" inquired the other. "Why," said the builder, "it would be impossible for me to find workmen to do their work so badly—such bad bond, such bad pointing, such wretched materials I never saw." It may perhaps shock the prejudices of the admirers of ancient glass to be told that the materials and workmanship of the old windows are like the palace at Hampton Court; workmen could not be found to do the work so badly. The glass on which the colours are painted is, from the impurity of its components, of a dingy green colour; the enamel colours are laid on, and burnt in, in the coarsest manner; the leading is clumsy and rude; but, in spite of all these defects, there pervades the whole a true artistic feeling, and this is the secret of the magic charm which we find in the productions of men who cared not for fame or wealth in comparison with the beautifying of the house in which God was to be worshipped. In our own day, when art has intermarried with manufacture, and the spirit of trade pervades our most sacred things, we look in vain for those works which are illuminated by the lamp of self-sacrifice. The customer with money to spare gives an order for a painted-glass window; the tradesman on whom the success of the whole work depends receives the order cap in hand; he makes his calculations, employs a designer to sketch out the subject, which is submitted to the customer, who, with little or no taste of his own, adopts the suggestions of the man whom he employs, who, with an eye to his own profit, is not likely to select the richest colours, or the most careful workmen to execute them; it is probable, indeed, that he has no share in the glass-house where the work is executed, so that the division of labour which is the feature of modern manufacture applies here also, and prevents each man from feeling that deep, all-pervading interest in his work which is necessary for success. What wonder, then, that under such circumstances of production many a modern painted window is pronounced to be a failure. The remedy for such a state of things lies in the general cultivation of taste—those who order

painted windows, those who look at them, and those who execute them being imbued with a portion of that artistic, if not devotional feeling, which has bequeathed to us so many monumental wonders. Some of the specimens of painted glass which have been executed

of late years, show that we have artists equal to their work, and that the principles on which this art must rest are appreciated and acted on. The chemistry of the art is all but perfect; we can produce glass of limpid purity as the recipient of the enamel colours; we can prepare these colours with the greatest precision, and produce tints of perfect purity and dazzling brilliancy, and we have colours which were quite unknown to the ancients. We do not say that such results belong to the ordinary glass-house, where cheapness, that Diana of modern Ephesus, reigns; but we do mean to say that, in those cases where the manufacturer is a scientific chemist, or employs one to direct his works, colours may be produced surpassing those of the ancient glass, and, if our artists are ready with their aid, and patronage is not wanting, there is no reason why the painfully glaring white glass of our church windows may not be exchanged for windows surpassing those of the best period of the art. We cordially agree with Mr. Oliphant's advice:—"Accept nothing but good glass, good design and execution, good and correct drawing, a composition suited to the place and subject, and an artistic treatment of colour worthy of the splendour of the material employed."

Our illustration, Fig. 243, is a remarkable example of the progress which has been made in the mechanical details of the glass manufacture of late years. Here is a design by Mr. Frank Howard, which, instead of being produced on numerous pieces of glass, is painted upon one entire piece upwards of nine feet in height, and nearly five feet in width, whereby the lead and iron-work are entirely got rid of. We are by no means sure that this is an advantage, for the artist renounces one of the peculiarities of the art, and, by his mode of treatment, enters into direct competition with the oil-painter. We must prefer the window shown in Fig. 244, now in the entrance-hall of Glenormistan. This estate is held from the crown on condition that the proprietor, when required, shall present the sovereign with a red rose on the festival of St. John. The design in the centre represents



Fig. 244.—WINDOW BY MESSRS. BALLANTYNE AND ALLAN, OF EDINBURGH.

this ceremony, which, it is said, was last performed in 1529. The picture, as well as the entire window, is surrounded by a rich border of ruby and gold, studded with imitations of gems; the background is pale blue, with gold bands stencilled in white enamel, with the united national emblems—the rose, the shamrock,

and the thistle. In the upper corners is the legend, "He that tholes (*i. e.* endures) overcomes."

The materials which are used in glass-painting as the sources of colour are similar to, if not identical with, those which are employed in painting on porcelain and enamel—only, in the case of glass, the colours require to be translucent, and for porcelain and enamel opaque. The colours, when fixed on the recipient, must be capable of resisting the action of air and moisture, and of the weather generally. They must expand and contract with the recipient, and, in fact, so blend with it as to form a part of its own substance. The colours consist mostly of metallic oxides, formed by the addition of silicic or boracic acid into fusible glasses, which, being reduced to powder and mixed with some vehicle, such as sugar and water, borax and water, oil of turpentine or of lavender, and so applied by means of suitable brushes, the whole is passed through the fire, when the vehicle, evaporating or becoming decomposed, the colour fuses and attaches itself to the surface of the recipient, whether that be glass, pottery, porcelain, or enamel. It is evident that the conditions required for these colours exclude all animal and vegetable matters, and limit the number to those of mineral origin, and even these are still further limited by their reaction on each other, or by the action of the fluxes employed to vitrify them. The ingredients of the recipient may even be inimical to the colour, as is the case with the potash contained in porcelain, the alkalis contained in glass, and the oxide of lead which is often found in the glaze of earthenware.

Vitrifiable colours, as now employed, differ considerably from those of the old glass-painters. During the period when the art was almost entirely neglected, the manufacture of common glass had greatly improved. During the most successful periods of the art it was, as already noticed, a hard, infusible glass of a greenish colour, formed chiefly of flint and potash, or soda. The materials, however, were far from being pure, and the glass-makers had not the method of making them so. The want of fusibility in this glass rendered it difficult to work, so that the small panes used for glazing were not only tinged with unintentional colour, but also wavy on the surface, so as to distort the objects seen through them. Mr. Oliphant finds a beauty in the "irregular manufacture" of the old glass. He speaks of its "broken surface, waved and speckled, yet nowise diminished in purity"—terms which we hold to be inconsistent with each other. The advantage which he finds in the "roughness and imperfection" of the old glass is that "you no longer feel a necessity to look through, but are able to look at these windows;" and again, he says, "this pearly radiance and glory, which is one chief attraction of old windows, is greatly owing not to secrets of the craft unknown to us, but to the inequality and broken surface of the material in which the elder artists worked. The power of glass so made to convey colour is quite unique, no kind of painting can at all come up to it." There can be no doubt that the ancients made the best use of their materials, and sought, as far as lay in their power, to remedy the defects arising from want of chemical knowledge and manipulative skill; but, to attempt to establish that the excellence lay in these defects, is to attempt to prove too much. Had they possessed purer materials, they would gladly have used them, and carried their art still nearer to perfection; for in this, as in every department of mediæval art, men did their best, and our efforts become ridiculous when we seek to copy beauties and defects alike—when we are able to avoid the defects, even though we cannot emulate the beauties. We must repeat our conviction that the excellence of the old windows is to be found in the artistic feeling which designed them, and that exquisite appreciation of the harmony of colour which knew so well how to distinguish the *enough* from the *too much*. But, however this may be, it is certain that when the glass-painter resumed his art, the materials with which he had to deal were no longer the same as those of the old artists. A more fusible and pellucid glass required that the vitrifiable colour should be burnt in at a lower temperature; and this required a readjustment of the metallic oxides and their fluxes, and this, again, necessitated better modes of firing than the old method of the iron box with shelves covered with powdered lime, on which to arrange the pieces of glass while being fired—a method which often led to a dulling of the surface, and a production of that translucency instead of transparency which Mr. Oliphant so much admires. The introduction of the muffle furnace, with watches and pyrometers for determining the temperature, the preparation of the pigments, under the legislation of known chemical laws, give to our results that precision

which must surely as much surpass the blind gropings of the ancient artists, and the secrets which they boasted should die with them, as the glass which serves as the recipient of the colour surpassed the dingy green of the olden time.

The substances used for vitrifiable colours generally are, for the production of *blue*, oxide of cobalt; for *red*, the protoxide of copper, gold in the form of the purple precipitate of Cassius, and the peroxide of iron; for *green*, the oxide of chromium, the binoxide of copper, and a mixture of oxide of cobalt, antimonious acid, and oxide of lead; for *yellow*, oxide of uranium, chromate of lead, and certain combinations of silver, also certain compounds of antimonious acid, oxide of lead, and the sub-sulphate of iron; for *violet*, protoxide of manganese, and the purple precipitate of Cassius; for *black*, a mixture of the oxides of iron, of manganese, and of cobalt; for *white*, ordinary enamel, which consists of a glass rendered opaque by stannic acid, or oxide of tin.

The temperature at which these colours fuse varies considerably. Most of them yield to a heat below that at which silver fuses: others require a heat equal to that of a porcelain furnace. Hence the nature of the flux requires to be carefully considered. In painting on hard porcelain there are two classes of colours, adapted to very high and to moderate temperatures. The former are limited to about three colours—namely, the *blue* produced by oxide of cobalt, the *green* from oxide of chromium, and the *brown* from mixtures of the oxides of manganese and of iron. These colours usually form continuous grounds, and so perfect is the vitrification that they penetrate the surface of the porcelain, and form well marked edges. The temperature employed being adequate to the fusion of felspar, that substance is used as the flux; thus indigo blue is produced from four parts oxide of cobalt, and seven of felspar, repeatedly ground and sifted, and fused in a crucible in the porcelain furnace. A pale blue is produced from one part oxide of cobalt, with thirty parts felspar.

By far the most numerous class of colours are those which melt at the lower temperature, and, being vitrified in a muffle, are hence termed *muffle colours*. The fluxes for such colours are usually the silicate of lead, a mixture of silicate of lead and of borax, or of the silicate and borate of soda and of lead. The colouring matter may either be mixed in proper proportions with the flux, and applied directly in the form of powders by means of a suitable vehicle, and a hair-pencil or brush, or it may undergo a preliminary fusion. The method of proceeding for porcelain is then carried on as described at the end of the last section.

In the preparation of stained, or painted-glass windows, there are two methods of proceeding. In the one method sheets of stained glass are cut up into the required forms, and are arranged and connected together by means of the leading, so as to form the required design. In the second method, white glass is painted according to a preconceived design with vitrifiable colours mixed with a proper vehicle, and laid on with brushes. The glass is then fired. It often happens that a combination of the two methods is adopted.

The colours used by the glass-painter being for the most part transparent, the number is much less than is used for painting on porcelain and enamel. Cobalt is still relied upon for blue; gold in the form of the precipitate of Cassius produces purples, violets, and carmine, according to the nature of the flux and the temperature employed, while peroxide of iron produces reds, browns, &c. Greens are produced by silicate of copper, sometimes by oxide of chromium—preference being given to copper, which forms a transparent colour, while that of chrome is opaque; often also with a mixture of blue and yellow, one side of the glass being painted blue, and the other yellow, the combined effect, as seen by transmitted light, being of course green. The blacks and the greys are produced by the oxides of manganese, of cobalt, and of iron; while the yellows are much the same as those used for hard porcelain.

Among the many peculiarities of glass-painting, arising from the nature of the material, is the fact that the artist can paint on either or both sides of the glass, and he is constantly in the habit of doing so—placing on the side next the spectator the shadows, which thus become more marked and distinct. He also usually places on the same side the gradated and more sombre colours, while all the brilliancy is thrown to the other side. There is this great convenience in being able to paint on both sides, that colours which would chemically injure each other, and produce undesirable tints if blended, can be used on opposite sides without coming in contact,

and therefore without detriment to the general effect. It is in this way that a scarlet is produced by painting yellow on one side, and red, from the precipitate of Cassius, on the other.

The smooth and polished surface of the glass offers some difficulties in the laying on of the colour. A second application of the brush will sometimes remove the colour deposited by the first, hence some artists roughen their glass by means of fine sand or emery; others change the vehicle whenever they wish thus to superpose the colours, placing a colour mixed with water upon a colour mixed with turpentine, and, as one vehicle is insoluble in the other, many layers may thus be built up without inconvenience.

As the colours which are passed through the fire generally have a somewhat dull effect, the artist employs these for the parts of the design which must be executed by hand, such as faces, inscriptions, &c., making free use of stained glass for draperies, skies, &c., introducing upon these such shadows as may be required.

Stained glass is formed in sheets or tables, at the glass-house, by ordinary methods. In the ground-plan of Mr. Pellatt's furnace, Fig. 207, three small pots for coloured glass are indicated in one group. Blue glass is formed by the addition of silicate of cobalt to the common materials of white glass; violet by silicate of manganese; green by silicate of copper; yellow by the action of smoke, or of antimonite of lead, or of chloride of silver; purple by means of copper; black by the oxides of manganese, iron, and cobalt mixed. Glass is made white and opaque by means of the hydrated oxide of tin. The appearance of opal is given by means of phosphate of lime, or of calcined bones. This last addition produces at first a transparent glass; but, if heated several times during the working, it becomes milky.

Blue, violet, and green glasses, which are formed by the addition of from one to two per cent. of the colouring oxide to the composition of ordinary glass, form what are called *pot-metals*. White

glass may be coloured yellow by covering its surface with a layer of clay, ground up with chloride of silver, and passing it through the muffle. When cool the layer of clay is removed, and the glass has a yellow tint, which may vary from a canary-yellow to a deep yellow, depending on the nature of the glass; glass containing from eight to ten per cent. of alumina takes a much finer tint than glass which contains only two or three per cent. The red from copper is so intense that, unless great care be taken, it is opaque; hence the method of flashing has been resorted to, which consists in covering white glass with a very thin coating of the red, for which purpose the workman dips his blowing tube into a pot containing red glass, and takes up a small quantity, he then introduces it into a pot of white glass, and takes out the quantity required, which is blown into a sheet by one of the methods already described. One of the advantages of flashed glass is that the red coating may be ground off, or melted off by the action of hydrofluoric acid, so as to show white designs on a red ground. This method of grinding is very common in the old windows.

The subject of glass-painting is very fascinating, and, did our limits permit, we might enlarge upon it. The charming effects produced in the Alhambra Court of the Crystal Palace by the judicious use of stained glass show how much might be done in other parts of the building, and we would suggest to the directors whether they could not turn some of their abundant space to good account by a collection of stained glass historically arranged. Without such an arrangement any collection would lose much of its value, and we would the more insist upon it since method does not appear to be a strong point in this institution.

In the foregoing remarks we have not wandered from the Glass Court of the Crystal Palace, since all that we have written will assist the visitor to an intelligent appreciation of its contents. The following group illustrates some of the graceful forms therein exhibited.



Fig. 245.—SPECIMENS OF ORNAMENTAL GLASS FROM THE CRYSTAL PALACE.

THE STATIONERY COURT.

In old times when books and paper, instead of being hawked about by pedlers or foot-travellers, were sold at fixed stalls or *stations*, the vendors were named *stationers*, and the miscellaneous wares which they sold *stationery*. The above Court at the Crystal Palace is more ambitious than the original stalls in St. Paul's Churchyard, which are said to have given the name; it resembles rather the modern stalls of the great book fairs of Leipzig, Frankfurt, and other towns of Germany. It exhibits various species of the great paper family, plain and ornamented; books in plain and fancy bindings, and the various mechanical means for writing them; a tempting fac-simile of the first book printed in England in movable type—"The Game and Playe of the Chesse, translated by William Caxton (upon the French translation of Jehan de Vignay). Westmonasterii, Guil. Caxton, 1474." There are also a number of steel and copper-plate engravings, also a choice collection of pictures by that rising young artist, Herr Sol—some of the photographs

is the work of Mr. Rogers, and the property of Mr. Claudet. Its height is about 7½ feet; it is in the Italian style, and hexagonal in form. Some idea may be formed of the style of the ornament from the figures in the following page, which represent two of the panels.

Altogether, the Stationery Court, with its agreeable blending of the Fine Arts and the Useful Arts, is an enticing place, such as the veriest bookworm and devoted classic would not hesitate to commit himself to for a spare hour, for amid the wide range of the Useful Arts these great authorities admit the value of printing. Alma Mater even has a printing-press of her own, and issues choice editions for the edification of her children. It is also within our own knowledge that two of her sucklings, who look with scorn on manufactures, nevertheless maintain juvenile printing-presses of their own, and from time to time issue among their friends poetry and scolia in bookings and leaflets composed and worked with



Fig. 246.—THE STATIONERY COURT, CRYSTAL PALACE.

being coloured, which we hold to be a mistake; lithographic prints, plain, tinted, and printed in colours, which last we also hold to be a mistake; the stones used in printing them; and "sermons in stones," in the shape of organic remains found between the layers; lithographic chalks and inks; artists' colours, and their component parts, in the prepared as well as the crude state (would that this breath of the spirit of the Great Exhibition of 1851 found freer circulation in the Crystal Palace); black-lead pencils, showing also the progress of the manufacture, a remark which equally applies to that of paper, music, and the movable types in which it is sometimes printed; maps of the Ordnance Survey; sealing-wax and wafers, and their formidable rivals, adhesive envelopes, in great variety; ledgers and copying machines; blank diaries, and a prospectus containing numerous unanswerable reasons why everybody should keep one. The stereoscope, which has made so much noise in our day, through the contentions of rival claimants to its invention, has a stand erected to its honour in carved box-wood. It

their own hands.* We also know a grave and learned doctor who indulges in the delectable art of book-binding, and inscribes in the

* We have lately received a volume of sonnets printed at the private press of one of these gentlemen, and we duly acknowledge the gift in the following

SONNET.

The sun that animates one half the world,
And cheers all nature with its wondrous power,
Presides with softened grace at vesper hour,
When the young moon or evening star has birth:
So does the Press, the world of intellect
Guide and encourage, animate, control—
Connect past times with present—cheer the soul,
Which else might pine in darkness and neglect.
Hail, glorious Printer's Art! thou art the sun
Of freedom: may thy rays unclouded be,
Shining while aught of good is to be done,
Scattering thy blessings over land and sea;
And from thy lofty station deign to bless,
Like moon or evening star, my friend's domestic press.

fly-leaf of the books thus honoured, "Bound by me," with the name and date. Such learned people regard the art of printing, with its subsidiary trades, as *the Useful Art*—the only noble trade worthy of a place in the universe! reflecting, as it does, the light and lustre of learning over the world.

Without venturing in such good society to assert the claims of manufacturers as benefactors of mankind, we are ready to admit all the praise of books that can be said or sung. They have doubtless before now formed the subject of many a prize poem.

"But what strange art, what magic can dispose
The troubled mind to change its native woes?
Or lead us willing from ourselves to see
Others more wretched, more undone than we?
This books can do; nor this alone—they give
New views to life, and teach us how to live;
They soothe the grieved, the stubborn they chastise,
Fools they admonish, and confirm the wise;
Their aid they yield to all—they never shun
The man of sorrows or the wretch undone;
Unlike the hard, the selfish, and the proud,
They fly not sullen from the suppliant crowd,
Nor tell to various people various things,
But show to subjects what they show to kings."—CRABBE.

People show their love of books in various ways. We can only speak of ourselves. Our affection for them is individual; we love books as books, not so much as Shakspeare, Milton, Bacon, but the books on our shelves which represent their mighty minds. It is a positive grief to us to see their bodies injured (we would extend the tax from dogs to dogs-ears), their garments torn, their faces soiled.

We regard books as the relics of the mighty dead—we look upon the printed page as we should upon the face of a friend's widow, with a wide margin of cap, sweetly discoursing of the dear departed. We love to see our books in smiling rows, nicely—i.e. neatly and usefully—bound (not in court-dresses, which one fears to handle lest we soil them) with marbled edges, their names in plain, honest characters on their backs. They must not be too large or too



Fig. 247.

heavy, but such as can be held comfortably in the hand, or pocketed on occasion; there must be no reluctance in the opening—they must spread themselves delightfully before you, as if they enjoyed being read. Our weak sight requires a good print, and our taste and scribbling propensities a wide margin—for we love to mark favourite passages, or note down a thought suggested by the text. Some authors are so suggestive—Bacon, for example—as to require the margin of a whole octavo volume for annotation; and the worthy archbishop who has filled so wide a margin has taken each essay as a small meal of pemican, only to be digested with his own accompanying pleasant, but lighter fare. Suggestive authors are those whose works must be your own property; they are not books to be borrowed, but kept, and cherished, and pondered over. These are the books that win the affections, and make one curious about rare editions and choice bindings. In such cases we love to see everything choice, even the book-mark, only, as before suggested, not too choice for use.

Some of the doings of the book-binder are incomprehensible. We have a great horror of landscapes and portraits on the edges of books, and we do not understand the use of jewels on the covers. It may be curious, and, in some cases, difficult, to draw on the edges of a book the author's or the owner's face, or the house or village where he was born, or which he celebrated (as in the case of "Sweet Auburn," which we saw a short time ago on the edges of an illustrated edition of Goldsmith's works); but, as the book cannot be opened without chopping the face or the landscape in two, and distorting the fragments, and the book cannot be used, even moderately, without wearing away the picture, we protest against such unfitness of place, of material, and of effect. So also with respect to jewels. They are out of place on the book-covers, for, when the book is being read, they cannot be seen, and they prevent

the book from occupying its natural position on the book-shelves. The same objections apply to the carvings and embossings in high-relief on the covers of some of the books in the Crystal Palace, where the binding occupies more space than the book itself, and is far more elaborately adorned. In such cases the purposes of binding seem to be forgotten. It is evidently more convenient to have a book in sheets, which can be folded so as, when cut, to make so many leaves and pages, according as the size is quarto, or octavo, or twelvemo, &c., than to have the book in a single sheet of enormous length, rolled round two cylinders of wood from the two extremities, as was done with the books of ancient times. The objects of binding are to collect, hold fast, and preserve from injury all the folded sheets of the book, to allow it to be handled and read with facility, and to occupy as little space as possible in its case. Now it is obvious that an elaboration of ornament on the sides of the book-covers must interfere with some or all of these objects, and therefore be out of place. A book for the drawing-room table is perhaps an exception—the sides may then be more adorned than those of a library-book; but it must be done judiciously, or the jewel-case may appear of more value than the jewels. In most examples the only position where the ornamentation can be seen is on the backs, and the amount of it will depend on the taste of the owner and of the binder. So also the amount and style of the ornament will be regulated by the subject of the book. An ornamental book should have an ornamental binding; just as a gay lady looks well in fine clothes, and a grave one in more sober attire.

No one would think of giving an ornate style of binding to a treatise on chemistry, or of treating history as if it were a *nouvellette*. We have often regretted that the style of binding were not generally regulated by the subject, as in law books. There is no mistaking law-binding, why should there be any mistake about history-binding, science-binding, poetry-binding, fiction-binding, &c.? Something of the kind has been attempted in the national library—books of a scientific character are bound in red, poetry in yellow, &c. This is useful because distinctive; it shows the subject of the book at a glance, and enables you to return it to its shelf without delay.

Owners of books, as well as books themselves, have their idiosyncrasies, and some of them are useful. One of our friends, a man of taste and learning, and a great devourer of books, finding them likely to overflow in his house, adopted an ingenious method of doubling his shelf-room by arranging his books in double rows, in such a way as to make the books in front indicate those behind. Thus, suppose Goethe's works, in 40 volumes, are to be arranged—the first 20 volumes are placed in front, thereby indicating that 20 more are behind; Gray's poems and letters, in two volumes, would have the first volume in front, and the second immediately behind. There is always something to be learnt in a well-ordered library, or, as the poet says,—

"La renouëule un jour dans un bouquet
Avec l'œillet se trouva réunie;
Elle eut le lendemain le parfum de l'œillet:
On ne peut que gagner en bonne compagnie."*

The Stationery Court is from the design of J. G. Grace. It is in the Composite style, and aims at being an application of cinquecento decoration to a wooden structure. The official description is as follows:—"Over the opening through which we enter, and between the stained-glass windows let into the wall, have been introduced

* These lines, which are from Béranger, may be translated thus:—

"One day there were found in a nosegay
Th' ranunculus and carnation together;
On the morrow the first shared the other's perfume:
One must gain in good company ever."

allegorical figures of the Arts and Sciences applied to the manufacture of the articles exhibited in the Court; and over the opening at the back the artist has depicted the genii of manufactures, commerce, &c. The interior walls of the Court are divided in the upper portions into panels; these have a groundwork of white colour, and borders of a deep marone, richly decorated with designs in gold; in the centre of each is a medallion, on which are represented cupidons, engaged in one of the various mechanical and scientific arts having reference to paper, printing, engraving, &c.; the spaces between the compartments are of a rich blue colour, also decorated with patterns of gold. The ceiling, or what is presumed to be such—for, as in all the Courts, a part only stands for the whole—is supported by deep projecting beams, very light in construction, and having the form of pendants; they are painted in imitation of dark oak, the mouldings being picked out with gold and colours. Above each of the compartments, or panels, is a small panel running horizontally, and of a blue ground, to harmonise with the intermediate upright panels alternating with the others."

In giving a brief account of some of the manufactures which the Stationery Court is intended to exhibit, we begin with paper, the basis of them all. Seldom has a waste material been turned to better account than in the conversion of old rags into paper. The spinning and the weaving of the fibrous materials, and their subsequent wear, are all useful stages in the preparation for paper; but, as the British Islands require every year no less than about 180 million pounds weight of paper to supply the appetite for newspapers (a single day's *Times* requires for its sixty thousand copies nearly nine tons weight of paper), for cheap literature, and the various other forms in which knowledge of some kind or other is multiplied, if not always diffused, there is no wonder that our consumption of linen and cotton goods should fail to supply sufficient rags for the purpose. Other countries, which are deprived of the blessings of free discussion and a free press, have enough rags for their own purpose and to spare; from some of them we obtain a certain supply; the waste of our immense cotton-mills contributes something, and straw is coming into use, especially for writing papers; but there are so many advantages in rags as a paper-making material that the demand is for them, and so long as they can be supplied at a moderate cost they are likely to supersede all other materials; but there is a difficulty in meeting the demand for rags.

The consumption of paper in Great Britain is about 4½ lbs. per head every year; in the United States of America, where, it must be remembered, there is neither paper-duty nor stamp-duty, it is 13½ lbs. per head (not including the slave population). Hence the United States not only do not send us paper-making materials, but compete with us in other markets for them. France, Holland, Belgium, and some other countries forbid the exportation of rags, whereby the difficulty is, of course, increased. This led, a year or two ago, to a rise of one halfpenny per pound in the price of paper; and this caused a difference of some ten or twelve thousand pounds sterling per annum to the proprietors of the *Times* newspaper in the supply of paper, and induced them to offer a reward of £1000 to any one who should discover a new, cheap, and readily-available material for paper-making. Since that offer was made the rag-market has become more easy; we are not aware that any new material has been found; but the inquiries which were set on foot showed that new materials exist in great abundance, and will probably be turned to account when another deficiency of rags shall again stimulate enterprise and invention. The warm and tropical climates possess inexhaustible stores of fibrous material, which, if imported as dunnage or in compressed bales, would be of great service. In India, flax is largely cultivated for the sake of its seed, while the plant itself is neglected; but, supposing the fibre were collected and sent over in the cheapest possible form, how vastly inferior it would be to rags as a paper-making material. All the cleaning, scutching, and dividing, the spinning, bleaching, and carding, the wearing, washing, and tearing which so admirably prepare linen for the paper-maker would have to be performed, as it were, at first hand, and would greatly add to the cost. The short staple flax and cotton of India may be had in any quantity, labour is cheap, and the labourers are neat-handed, ingenious, and eager to work; there is water in abundance, and a bright smokeless sky; all that are wanting are the skill, the machinery, and the capital to produce paper sufficient for the wants of the whole civilised world. The only cloud that obscures this bright prospect is the doubt whether paper could be made and distributed at a sufficiently cheap rate to

answer the purpose of the producer and the consumer. It has been suggested that the materials of India might be brought to the condition of *half-stuff*, made up into cakes, dried in the sun, and so imported into this country, where our machinery would be ready for its reception. But the want of roads in India, and the indifference of our great manufacturers to the subject do not offer much encouragement at present to the Indian paper-maker. Another suggestion was that of the plantain, which forms the food of so large a portion of the human race in tropical countries, should furnish the materials for paper. The fruit weighs from 30 to 80 lbs., and at the time this is gathered the stem is cut down and allowed to rot. What if it were collected and sent to England as paper-material? The very worthlessness of the article is the difficulty. By the time it was collected, compressed, and consigned to the ship it would acquire value; the transmission of it to this country would so far increase the value as to render it a question whether the paper made from it could be sold so much lower than the paper made from rags as to encourage all parties concerned to go on with the manufacture. At any rate, while rags are tolerably abundant, it is scarcely to be expected that plantain-fibre will be imported to take their place. There is no doubt of its adaptability to the purpose, some excellent specimens having been brought to this country; and Dr. Royle mentions the refuse of manilla hemp, or worn-out manilla ropes, as forming an admirable paper-making material. The refuse of sugar-cane, in the West Indies, has also been favourably mentioned; but the objection of the distance from the home-manufacture applies to this material also. Of the substances of home-production, straw has been already mentioned, and is now in constant use, either alone or mixed with rags. Patents have been recently taken out for the manufacture of paper from wood, from hop-bines, from couch-grass, from water-broom, &c. Each material requires a special treatment in the earlier stages of the manufacture; but this we shall pass over, and proceed to sketch in general terms the processes through which the rag, or raw material, is made to pass in the course of its conversion into paper. These processes, so far as their principle is concerned, are the same which have been practised for ages by the Chinese, who could also teach us many a lesson in the adaptation of vegetable substances in great variety to this use. They use linen rags, as we do, but they have many other resources. The entire substance of the common cotton shrub and of the bamboo, the leaves of the latter only excepted, is reduced to pulp by soaking in water, burying in dry lime, washing and drying in the sun, boiling in cauldrons, and pounding in wooden mortars. The inner bark of the paper-mulberry and other trees is also used, not simply as uncivilised nations employ such substances as a natural paper, or as the Egyptians, by the simplest methods of preparation, laid out the celebrated *papyrus*, but in the ordinary way of reduction to a pulp, which is performed in the most painstaking and effective manner by the natives of both China and Japan. This reduction of material to the state of pulp is the serious part of the business in making paper; the after processes are much more easily accomplished. In the case of rags the difficulty is partially surmounted by the previous manufacture of the article, which has brought it into a condition not very dissimilar to that of paper, so that, under certain precautions, linen can be written or printed on with facility. But, in order to bring rags into the *actual* condition of paper, they must be cleansed, sorted, boiled, washed, bleached, and beaten into a beautiful creamy liquid, spotless and delicate as the contents of a dairy. To view the processes by which this wondrous conversion is effected, we shall be led into no unpleasing spots or associations. In whatever neighbourhood one may chance to be located, the prettiest walk and the most tranquil scenery are sure to be "in the direction of the paper-mills," where such are in existence. In few manufactures is so much water employed, and in none is its quality so important as in the manufacture of fine paper. Therefore a considerable stream of pure water, uncontaminated by any neighbouring abomination, is the first requisite in determining the site of a paper-mill, and where such pure streams are found, there the usual adjuncts of rich pastures and luxuriant foliage are found also. Guided by the humming sound of machinery, we traverse the pastures and enter the paper-mill, where the first objects which attract our attention are the women engaged in *sorting* the rags. Each woman has a sack filled with rags on her left hand, from which she takes out handfuls, and rubs them briskly against the wire top of a deep box which stands before her. This removes much dust and dirt

from the rags, as a preliminary to further examination. A sharp knife is fixed in the top of this box, with its edge turned away from the woman. This she uses to cut away seams, buttons, &c., from the rags, and to divide the latter into very small pieces. As she does this, she observes the different qualities of the rags as to coarseness or fineness and wear, and puts them into different compartments of another box, standing to the right of that which receives the dust and refuse. This is done with much rapidity, and completes the sorter's work.



Fig. 240.—SORTING THE RAGS.

Next we observe that the rags are transferred to large cages of wire, as much as six feet in diameter, and ten feet in length, to undergo a further operation of *dusting*. These cages do not revolve, but they enclose a revolving axle, with a number of spokes reaching nearly to the sides of the cage. The rapid motion of the axle tosses about the rags with such energy that a large amount of dust is again set free, but this is prevented from escaping into the mill by an outer case of wood or sheet-iron which encloses each cage, and into which the dust falls with a sufficient amount of fibre to make it worth saving for the inferior purposes of the manufacture, such as railway tickets. This is also the case with the dust of the sorter's box.

The rags are next *boiled* in iron cylinders, with water which generally contains lime or soda, for the removal of grease; but, as these substances injure the fabric while they remove the dirt, the best paper-material is boiled in pure water only. The cylindrical boilers are mounted on pivots at their ends, and made to revolve slowly, so that the rags are kept in constant motion while boiling.

Thus cleansed and purified, the rags are transferred into what is called a *washing-engine*; but this does not express the chief use of

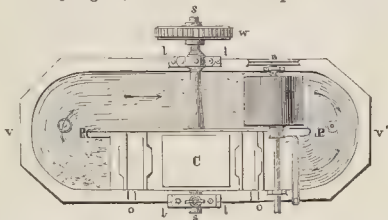


Fig. 250.

the apparatus, which is to tear and divide into minute fragments the softened rags. For this purpose the engine or vat *v v*, Figs. 250, 251, has a set of blades *B*, so fixed and arranged at its

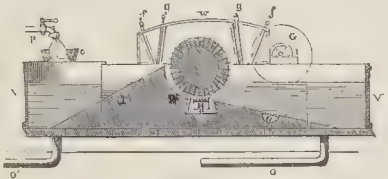


Fig. 251.

lower part that they shall act in unison with a number of revolving blades which cover a cylinder *c*, called the *roll*. The rags, immersed in water, are set in rapid motion by the action of this roll, which may revolve at the rate of 120 or even 150 revolutions per minute. Space is left in the trough by means of a partition *p p*, for the rags to make a circuit in the direction of the arrows, and return continually beneath the action of the blades, while at the same time the dirty water overflows into a waste pipe at *g*, and fresh water is admitted in a regulated supply at *p c*. The distance between the fixed blades and the revolving ones can be lessened or increased at

pleasure by lowering or raising the roll on its bearings *ll*, so that, as the work proceeds, the rags can be more and more completely torn and separated by the teeth. The water is prevented from being whirled out of the vat by the centrifugal action of the roll by means of a cover *fg*. At one part of the vat is a breasting *b'*, curved to the form of the roll, and nearly in contact with its teeth, and an inclined plane *i* passes from the bottom of the vat to the top of the breasting. As the rags are drawn between the cutters and are subjected to the double set of teeth, they are thrown over the top of the breasting upon the inclined plane, down which they slowly slide, and, passing round the partition, are again brought under the action of the teeth. Any solid substances which might injure the teeth are caught and retained in a hollow *a*. In this operation with the washing-engine, as it is called, a further portion of dirt has been carried off from the rags by the water, but they are not yet by any means of a pure white. In fact, if they were manufactured at this stage they would only make *whitey-brown* paper. The condition to which they are now reduced is that which is technically known as *half-stuff*; the state to which foreign raw materials should be reduced by some simpler process before they are transmitted to this country.

Supposing that we witness the operations necessary for writing and drawing papers, we must repair to the bleaching-house, a long apartment with a railroad down the middle, and stone chests along the sides, each chest being about three feet deep, and having a sieve-like false bottom, and under this a valve which can be opened at pleasure to allow the contents to escape into a large tank extending under the chests the whole length of the room. The half-stuff, drained from the water of the washing-engine, is brought in boxes along the railroad, and placed in these chests, or vats, with water impregnated with chloride of lime—the action of which valuable substance soon changes the brownish tint of the rags to snowy whiteness. In twenty-four hours, and after repeated stirrings, the stuff is drained by the arrangement just noticed, and is then lifted into a railway-box and conveyed to a hydraulic press, where the remainder of the solution is pressed out. It must be stated, however, that the whole of this bleaching process is omitted in papers where great strength and durability are more valued than whiteness.

The sixth operation, called *beating*, is merely a repetition with more powerful machinery of the fourth, or washing process. The beating-engine, Fig. 252, has more blades on the roll, and a more

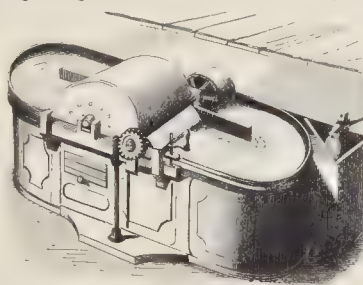


Fig. 252.—BEATING MACHINE.

rapid motion than the former; the process is also continued longer, so that the linen is torn into its finest fibres, and, when drained from the water, it may be heaped up like clay, but has the pure whiteness of snow. The substance is now no longer half-stuff, but has become the perfect and complete *stuff*, or pulp, of which paper is to be made.

In making paper by hand, this pulp has again to be diluted with pure water to the consistency of milk, and is made to flow through a strainer, which separates knots, &c., into a vat provided with means for keeping the pulp warm and in motion during the succeeding operations. A man then dips a mould, or shallow rectangular frame, Fig. 253, with a movable rim, Fig. 254, called a *deckle*, and a bottom of close parallel wires for laid paper, and wire-gauze for wove, into this vat of milky liquid, and takes up just that quantity which practice tells him will be wanted for the required sheet of paper. This he distributes equally over the mould by a gentle shaking as the water drains away. At the same

time the filaments are deposited on the mould in that combined or felted manner which forms an even sheet of paper. This is passed



Fig. 253.



Fig. 254.

(still on the mould, but without the deckle) to another man, who has laid out a piece of felt quite smoothly to receive the sheet, and who turns the mould over upon it, when the sheet becomes transferred to the felt, and the empty mould is handed back to the first workman, who by this time has another mould and sheet ready to put into his companion's hand. The work goes on thus, a sheet of felt being laid between each sheet of paper, until a pile is raised of six quires, or 144 sheets, or one *post*. The whole pile is then placed in a powerful screw-press, and is soon reduced to a third of its original height. Twenty such *posts* are sometimes produced in a day. The *pressing* of the sheets is varied after a time by removing the felts, and pressing the sheets of paper in contact with each other. The *drying* is performed in large lofts, where the sheets are hung across a multitude of hair lines. By this simple means is produced a complete sheet of paper; not such as we could write upon, for, even when dry, the ink would run, as upon blotting-paper: but, so far as the actual substance of the sheet is concerned, nothing is required except the addition of size to make it a serviceable article. Even in its present state it forms, according to thickness and quality, the kinds of paper known as *tissue-paper*, *copying post*, *blotting-paper*, *filtering-paper*, and *plate-paper*. What is called the *water-mark* is formed by insertion into the wire mould of a certain design, such as letters or figures in wire, which, standing up above the general surface, causes the deposit of pulp to be a little thinner there than in other parts. A blue colour is given to paper by means of a small addition to the vat of stone-blue, of smalt, or what is now more common, of artificial ultramarine.

The next operation is called *sizing*. The man who performs it takes up as many sheets as he can conveniently hold in one hand, and dips them into a vat of warm liquid animal size, which has a certain portion of alum added to it to preserve it from putrefaction. The sheets of paper are placed in a press to remove the superfluous liquor, and are then hung up singly for the final drying, which is slowly performed in order that the size may thoroughly penetrate the paper. After the drying of the size, many writing papers are finished by certain smoothing processes. They may be placed in a powerful press between two glazed cards, which again are inclosed by two thick smooth plates of cast-iron, which have been heated in an oven—this is *hot-pressing*; or they may be finished between plates of copper and passed between rollers—this is called *milling*; or they may be passed between two rollers, one of polished iron, the other of solid paper—which is called *rolling*, or *calendering*. High *glazing* is attained by repeatedly passing the paper between the rollers; for the iron roller is a cylinder into which steam is admitted, and this produces heat enough to give a high finish to the paper. By the slight yielding of the solid paper cylinder, the iron one is preserved from indentation, which would soon be the case if both were of iron, and great quantities of hard writing papers were in process of manufacture. There are many offices for women and children in these final processes, who work at numerous tables supporting the small roller mills, all of which are driven by connection with the general prime-mover, whether a water-wheel or a steam-engine.

This brief description of paper-making by hand will sufficiently show what is the nature of the several processes employed in the conversion of pieces of rag into sheets of paper, and, if we would gain an idea, however faint, of paper-making by machinery, we must keep these processes in mind, and remember that the workman's labour is in every case closely imitated by the beautiful self-acting machinery which is now so largely in use, with this remarkable difference—that instead of the breaks and delays in the work, caused by shifting it from one person to another, and conveying it from one room to another, the whole affair is here carried on without check or interruption. At one end of a long room we see a stream of milky liquid issuing from a tap, and spreading out in a broad shallow stream, while at the other end of the room we find that this stream, without any interruption to its onward flow,

has become a firm sheet of continuous paper, gathered up by a reel, or delivering itself over a roller to have piece after piece chopped off by a machine-driven knife, and falling in finished sheets on a heap below. Instead of the wire moulds we see an endless wire-web; instead of separate sheets of paper an endless sheet; instead of the gentle shake given by hand, we find a vibration of the machinery; instead of the draining between pieces of felt, there is a passing of this endless sheet, supported by its web of wire-cloth, over the mouths of air-boxes, or boxes partially exhausted of air; instead of the screw-press, there are rollers between which the paper loses part of its moisture, and is then able to leave its supporting wire-cloth, and pass along to the first felt, or blanket, which conveys it to another pair of rollers, where it receives severer pressure, corresponding with the "wet press," and is passed to another blanket, which takes it to the last pair of pressure rollers. Here the making is complete, and the drying processes commence. The paper now leaves the blanket, and, instead of being taken to the drying-loft, it passes to the first pair of drying cylinders, which turn at exactly the same rate as the pressure cylinders, and are heated by steam admitted through their pivots. Some machines have as many as 20 of these drying cylinders, and in passing between them all the moisture from the paper passes off in steam, and would occasion much inconvenience by condensing on the roof above, and falling down in drops on the paper, were it not for a canopy which is raised on pillars on purpose to protect the newly-formed and delicate paper from this accident. In this way the paper completes its journey, and is wound up on an hexagonal reel, driven with the same speed as the other parts, unless a cutting machine be attached to the same train, in which case it is at once divided into printing or writing sheets.

The rate of speed at which the paper travels varies from six inches to one foot per second, or from one third to two thirds of a mile per hour. The whole journey from the strainer to the reel comprises about 60 feet, therefore the pulp passes from the liquid to the finished state in the space of from one to two minutes, instead of one week, which is the time occupied by the same processes as performed by hand. The sizing may be applied to machine-made paper after the cutting into sheets, but before any glazing or other surface-finishing, in which case it exactly resembles the operation on hand-made paper; or it may be performed on the dried web before cutting into sheets, or it may be mixed with the pulp in its liquid state. This last process saves not only the distinct operation of sizing, but also the whole second drying, and therefore greatly economizes time and labour. We owe to the French the discovery of several kinds of vegetable size, which are applicable in this way; the subject having been deemed of sufficient importance by Napoleon I. to employ a commission for five years in its investigation. The chemists forming it were not successful, but the subsequent researches of another chemist, M. Braconnet, led to the desired result. The first, or gelatine method, may be thus described. An endless felt passes round three or more revolving rollers, the lowest of which is immersed in the vat of size. A woman or child lays each sheet on the descending slope, and it is rapidly carried through and impregnated with size, and as rapidly delivered on the other side to a hand which picks off each sheet, and hangs it up in the drying loft. Or, if in continuous length, it is passed through a narrow slit into a very long room, almost filled with skeleton drums, over and under which it winds, so as to have the greatest possible length exposed before winding on the reel, and thus to imitate as nearly as may be the effects of air-drying in lofts. The room is warmed, and the air is usually agitated by means of fans, or winnows, made to revolve rapidly within each skeleton drum. The finishing of the paper is then performed in one of the methods already described, and it always receives its last pressure between the plates of a screw, or hydraulic press. The manufacturing stationer, however, before cutting and packing it, usually glazes it again by the process of *milling* between plates. A ream contains 472 sheets in 20 quires, of which the two outside ones commonly have only 20, and the other 18 have 24 sheets each, and no defective ones, which are all collected to the outsides, and retailed at a lower price.

Such is the merest outline of proceedings, the full description of which would fill volumes, and the inspection of which is calculated to excite our highest respect for the inventive genius of the men who have devised and carried out the remarkable series of improvements referred to. Their labours have, indeed, helped to bring us

into the difficulty already referred to by accelerating the production, and increasing the consumption of paper; but, when we consider the benefits which have accrued to mankind through their exertions, we shall not be disposed to quarrel with them for the share they have had in producing the inconvenience of a deficient supply of materials for paper.

We now pass from the manufacture of paper to the art of printing with movable types, which has conferred such vast benefits on mankind; and we cannot but regard it as an astonishing circumstance that during many thousand years men should have constantly been, as it were, on the threshold of this great discovery, and yet not have made it until within about four hundred years. The stones and rocks which, by a process of natural stereotyping, present us with the foot-prints of extinct animals, and the printed impressions (*first proofs*, so to speak) of the Flora of a former world,*—the steps of a man on the sea-shore,—the abundance of impressible clay and other substances in familiar use,—all suggest the multiplication of copies by means of pressure, an idea which we see carried out in the use of seals and signets, which are mentioned in the earliest record of the human race that we possess. The Chinese so far improved on the idea, as to print books by means of blocks, containing all the words cut out after the fashion of our wood-engravings, one block for each page. Had that ingenious nation been in possession of an alphabet, they could scarcely have resisted the idea of employing, instead of one block for one page of one particular book, separate letters for the words of any page of any book. Indeed, this seems to have been the natural order of the discovery in Europe, where separate blocks were used for the separate pages of certain pious picture-books, the idea being probably taken from playing-cards, which were thus printed; but the wooden type formed after this fashion would be rude and clumsy, and not adapted to the production of books such as scholars would be likely to read—since, in the infancy of the art, and, indeed, long afterwards, the number of persons who could read was small compared with those who could not; for the lower orders, always apt to copy the coarse manners (the courtly ones being beyond them) and prejudices of their betters, regarded with scorn the "clerk" whose business it was to read and write. At the very time when Gutenberg, Fust, and Schöffer were busy with their great invention in Germany, a scene is represented as having occurred in England which shows the estimate in which the ignorant poor held reading and writing. When these accomplishments were proved against the clerk of Chatham, Jack Cade exclaims, "O, monstrous!" and when one of the rabble further declares, "We took him setting of boys' copies," the ready conclusion was, "Here's a villain!" When questioned as to whether he wrote his name, or made his mark "like an honest, plain-dealing man," and he replied, "Sir, I thank God that I have been so well brought up that I can write my name," he was condemned to be hung "with his pen and ink-horn about his neck."†

Now, although we are not here quoting history, we have in Shakespeare's living pen a graphic touch of that angry, jealous feeling which long prevailed on the part of the unlettered against the lettered (one of the numerous forms of envy, in fact), and which is not now quite extinct, although the paper-maker and the printer are every day removing the cause for the complaint; so that at the present time it is so far from being regarded as a reproach to be able to read and write, that the shame is usually attached to the defect of those attainments. Such a happy change could not, however, have been brought about by *block-books*, and *Biblia pauperum*. A great social change must, if not begin with, at least meet the favour of, men in authority,—they form the river-head of society; their opinions, habits, and manners descend to the lower level, and operate for good or for evil. The scholar and the priest, the noble patron and the poet, the writers, users, and collectors of books were to be conciliated; the scribes and illuminators of books would be sure to object to and oppose the mighty change, as the former class would be likely to welcome it, if not

too novel to be startling, and not too cheap in its results to be common. Hence the worthy trio of Mayence endeavoured to make their type resemble as much as possible the character in common use among the transcribers of manuscripts, neither larger nor smaller. This could not be well done by means of wood-engravings, for the art as then practised gave neither sharpness of outline, nor delicacy of finish; and the material, in the subdivided form of type, would not allow of the rough handling required in printing. Nevertheless, such a method seems to have preceded the invention of the art of printing with movable metal type. The Dutch claim the invention for one Coster, of Haarlem, about the year 1420; and state that a *Donatus*, or Vocabulary, and the first three editions of the *Speculum humanis Salvationis*, were printed in movable wooden type. They further state, that one of these books falling into the hands of Gutenberg, while residing at Strasburg in 1435, suggested to him the idea of printing in movable metal characters. The evidence for these statements we hold to be either fabricated or insufficient; but we cannot, on this occasion, go over the ground for such a conclusion, nor the reasons why we believe Gutenberg to be the inventor of printing, first in movable wooden type, and afterwards, in conjunction with Fust and Schöffer, in movable types of metal.

A few trials with wooden type would be sufficient to prove how inadequate that material is for the production of books. The letters must be formed in metal, or the whole thing would prove a failure. When Gutenberg was endeavouring, unaided (or rather impeded, by men whom he took as partners for the sake of the money which they brought into the concern), to bring out his one grand idea from the darkness of conception to the light of practical reality, he saw no other method than that of carving or chasing each letter separately; but the progress thus made was so slow and costly, and the artist's wages so high (for the chaser was an artist in those days), that the transcribers, had they been aware of the momentous change which was being contemplated, might have smiled at the notion of their craft being in danger. But when Providence has raised up a man destined to work some vast benefit for his fellows, the difficulties and even dangers of the task become stimulants to further exertion,—he is not allowed to cease from toil until the end has been accomplished, or at least until he has intrusted to others the grand idea which has moved him. At this time the invention of printing was necessary for the glory of God and the good of mankind; the Reformation was at hand; men's minds had long been preparing for the mighty change which would free them from spiritual bondage; but how was the work of the Reformed Church to be carried on without an open Bible in a living language? and how could the Bible be open to the great mass of the people unless, instead of being exchanged for a house or a field, it could be multiplied cheaply, so as to be placed within the reach of every man? Not many years after Gutenberg had been labouring in his house at Strasburg, endeavouring (foolish man!) to keep his art secret, and practise it, when perfected, for his own peculiar benefit, the young monk in his cell at Erfurth was testing his practice, and that of his spiritual superiors, by the light of divine truth—by that very Bible which Gutenberg's art was to spread among the nations. The honesty and singleness of purpose of Luther finally triumphed, and he had the glory of testifying before men, and of seeing the truth prevail. The double purpose of Gutenberg misled him. He was not working *only* for the glory of God and the good of men, and so he was not permitted to carry out his invention. New difficulties arose at every step, and having expended his own private fortune in the undertaking, and borrowed money at interest, and expended the partnership money, he was at length reluctantly compelled to seek the assistance of some one better skilled in the working of metals than himself, and at the same time possessing sufficient pecuniary means to carry out the project; accordingly, he quitted Strasburg, and resorted to John Fust, the wealthy goldsmith of Mayence, laid before him his plans, and shared with him his long-cherished secret. The goldsmith rightly estimated the value of the invention, formed a partnership with the inventor, and proceeded in earnest to improve upon Gutenberg's process. The first thing that was done was to introduce the art of casting,—to form plaster-moulds of the letters, and to fill them up with melted metal. But the letters thus formed were destitute of sharpness, and had to be finished by hand, and that hand, be it remembered, the hand of a cunning workman, not that of an ordinary journey-

* The extinct vegetable forms of the coal deposits of Bohemia are among the most remarkable in the world. The roof of the galleries in the coal-mines is described as being "covered with a canopy of gorgeous tapestry, enriched with festoons of most graceful foliage, hung in wild, irregular profusion over every portion of its surface. The effect is heightened by the contrast of the coal-black colour of these vegetables with the light ground-work of the rock to which they are attached."—BUCKLAND'S *Bridgewater Treatise*.

† Shakespeare, "King Henry VI.," part ii. act iv.

man at ordinary wages. Moreover, a new mould was required for the casting of every individual letter. Many attempts were made to improve the moulds, but they ended in failures. Thus baffled, the partners shared their design with a third person. They sought the assistance of Peter Schöffer, a transcriber of manuscripts, and known to Fust as a skilful designer of patterns for gold and silver plate. In this latter capacity he must have been acquainted with all the resources of the goldsmith's art, or he would not, of course, have been competent to design for it; and in the former he was well acquainted with the tastes and wants of bookish men, so that he seems to have been well qualified to assist the two partners. Moreover, his ingenuity was stimulated by the bright eyes of Fust's pretty daughter, and by the promise of her hand, should he succeed in rearing the nursing art. No wonder that Schöffer set resolutely to work,—no wonder that he succeeded. He saw that, in order to the due multiplication of type, it was necessary to have a mould for each letter; but in order for the types to be produced cheaply, the moulds must be permanent; he also saw the necessity for having a complete alphabet of characters nicely executed, for the purpose of forming the moulds; and the happy thought occurred to him to make each character in the form of a punch, and of steel, so that after having been carefully executed by hand, it could be hardened for use. The moulds could now be made of iron, or even of steel, and also be hardened, and such precision could be given to the form of the mould that the letter could be turned out perfect and fit for use, or nearly so. Such is substantially the nature of Schöffer's inventions; we are not informed as to the share that Gutenberg and Fust had in them: they doubtless aided by their counsel and assisted in the experimental trials, which must have been numerous; and the three partners must have often discussed the matter long and anxiously. We are not even informed as to the precise details of the invention, for the partners, alive to their own interests, held it necessary to be secret. No sooner, however, was success insured, than difficulties arose in the adjustment of those very interests of which their owners were so careful. Gutenberg probably claimed more than his share of the invention, and Fust and his son-in-law were probably disposed to concede to him less. At any rate, they took their oyster to the lawyers to divide for them, and Gutenberg seems to have had nothing but the shell. He left his partners in disgust—a most unjust decree of the law court deprived him of his well-earned share in the profits which were now about to accrue from the practice of the infant art, and with the assistance of Dr. Conrad Humbracht established a rival printing-press in the same town. After carrying on this establishment for a few years, Gutenberg abandoned the art which had occasioned him so much grief and loss, and in 1465 entered the service of the Elector Adolphus of Nassau.

Not many months after Gutenberg had retired from the partnership, namely, in August 1457, Fust and Schöffer produced the celebrated *Psalter*, the first book that bears the name of the printers, the date, and the name of the place where it was printed. Three years later the celebrated Latin *Bible* was published. These and other works which issued from the press of Fust and Schöffer are remarkable for taste and beauty, and are still much prized by book collectors. Fust appears to have travelled about with copies of his books for sale. It was not the fashion in those days for men to publish their travels, or we might have had a curious chronicle of the wanderings of Fust. The astonishment occasioned by the number and cheapness of his books, compared with those of the transcribers, must have been great: the readiness with which men adopt any conclusion, however absurd, if it only save them the trouble of thinking, and the habits of close investigation which thought leads to and requires, favoured the belief that the devil had assisted Fust in the production of his books, and hence arose the popular story of "the Devil and Dr. Faustus." The worthy folks did not consider that if the enemy of souls had turned printer, he would not have multiplied copies of the Book which told how souls were to be saved; he would rather have continued to preside over the press which worked playing-cards; or if the Cardinal Bishop of Ostias' estimation of chess, as a "vanity which defiles the hands and the tongue," is to be received, he would rather have been printer's devil to Caxton when he brought out his "Art of Chess Playe."*

* In the work printed at Cologne, which preceded the "Art of Chess Playe,"

While Fust was on his travels, Schöffer had the management of the printing-press at home. His business must have been thriving, for there was a great demand for the productions of the new art, which everywhere excited curiosity and pleasure. Schöffer gave as little information as was possible respecting its details; but the demands for books required that he should employ many skilful workmen, who soon became acquainted with all the processes. This state of things might have continued for many years, had not Providence ordered otherwise. The moral government of the world required that books, and especially the Book, should be rapidly and well-nigh simultaneously diffused, and the effect was brought about by one of those astonishing events which baffle human calculation. One of the miserable squabbles among the petty and ecclesiastical princes of Germany led to the capture of Mayence, in 1462, by Count Adolphus, of Nassau, the effect of which was to destroy, for a time, the trade of the town. The friends of letters might well have regarded it as a calamity that the young art which promised so well for literature should be, as it were, strangled in its birth: the press was stopped, and the workmen quitted the town in search of employment elsewhere. Now this very dispersion was a broadcast sowing of the young art. Wherever the workmen settled, a printing-press started up; and this became a new centre which radiated its influence, and suggested its example to other towns, so that within six years of the publication of the *Psalter*, the art was established in many of the towns in the vicinity of Mayence, and within fifteen years there was at least one printing-press in every considerable town of Christian Europe. Nor had Schöffer any reason to repent the loss of his monopoly. His father-in-law being dead (he died at Paris in 1466), and tranquillity being restored at Mayence, he formed a partnership with Conrad Henlif, and continued during many years to publish valuable works, the number of which amounts to no less than fifty.

Our own Caxton is said to have learnt his art from one of the fugitive printers of Mayence. He was residing in the Low Countries at the time, and with the aid of this man established a printing-office at Cologne, at that time the Rome of Cisalpine Europe. The church, in the plenitude of her power, regarded the printing-press with favour, for it was used by the early printers under her patronage, and it was used by herself as early as 1454 for the multiplication of those very Letters of Indulgence which roused the indignation of Luther, and was one of the direct causes of her overthrow. But there was as yet no Reformation to cause uneasiness to the church which was of this world, and she was not permitted to see how dangerous a rival she was cherishing; one whom the people would adopt when she herself was cast off, or as Herder expresses it, "Eine gesammte sichtbare Kirche worin die Presse das Wort ersetzt" (a collected visible church where the press gives the word).

The art of casting type has attained great perfection in modern practice. The type-founder's art is one of great complexity in consequence of the large number of sizes of type in common use, and also from the large variety of *sorts* or characters belonging to each size. Book types include eleven or twelve varieties of fount, from *Great Primer*, which is the largest type used for books, to *Diamond*, which is the smallest. *Great Primer* is used in large Bibles, and is hence called *Bible Text*; but it is now seldom employed. The next size is *English*, which is used for church Bibles, and works in folio and quarto. *Pica* is the next type. It is used for works of a standard character, such as history, art, &c.; but *Small Pica* is, perhaps, the most extensively used letter. Novels are printed in this body. *Long Primer* is in common use in 12mo. works, also for dictionaries, &c., where a large quantity of matter is required to be got into a small space. *Bourgeois* much resembles *Long Primer* but it is smaller. *Brevier*, formerly used for printing Breviaries, is much used for small works and for notes. *Minion* is used for pocket editions, Prayer-books, and Bibles, and also for advertisements. For similar purposes *Nonpareil* or *Half-Pica* is also used. The next size is called *Pearl* or *Half-Long Primer*, then follows *Ruby*, and lastly *Diamond*.

Each of these founts consists of five alphabets, namely, A, A, a,

Caxton thought it necessary to explain that the book was *printed*, "not wroten with penne and inke, as other booke ben, to thende that every man may have them attone [at once]; for all the booke of this story, named the Recule of the histories of Troyes, thus enprinted, as ye here see, were begonne in oon day and also fynished in oon day."

A, a; there are also many other characters, making the whole number of each fount about two hundred, all of which require to be exactly alike, except in *device* and *width*, the greatest width being for the *W* and *M*, and the smallest for the *i* and *l*. Each of these numerous characters requires for its formation a punch, a mould, and fused metal. The punch is a piece of steel with a single character at one end: it is formed by hammering down the hollows and filing up the edges of the metal in a softened state. The matrix is a small piece of copper, two forms of which are shown in Figs. 255, and 256, each containing a sunken impression



Fig. 255.



Fig. 256.

formed by striking upon it the raised letter on the punch, so that in order to form the type, a quantity of fluid metal poured into this hollow, would come out an exact counterpart of the letter on the punch. But the cast letter requires a support or body, *b*, Fig. 257,



Fig. 257.

an appropriate width *w*, and certain nicks or notches, seen below *w*, to enable the compositor to place the letter in the proper position in the composing-stick. The measure of the type is determined by the type-mould, the formation of which is peculiar. Such a mould, for example, as is shown in Fig. 258, does not admit of contraction to suit the various widths of the letters, for if the piece *p* were slid upon the mould, it would not alter the width of the type, as represented by the shaded portion. If the mould were formed of two parts, as in Fig. 259, and one part were slid upon the other after the molten metal had been poured into the central square cavity, there would be a contraction in width but a distortion in form, as shown by the shaded part out of the mould. But if the mould were made of two parts, as in Fig. 260, it is evident that, by sliding one part



Fig. 258.



Fig. 259.



Fig. 260.

upon the other, the square cavity in the centre, while retaining the same height, could be diminished in width to any extent required. The type-mould, Figs. 261, and 262, is based on this principle. It

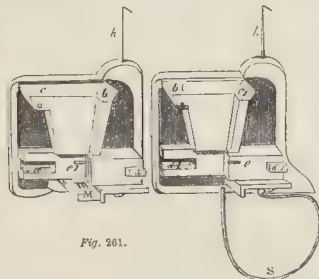


Fig. 261.

consists of two parts of steel, with a cover of wood on the outside, so contrived that, on being put together, *a'* fits into *a*, *d* into *d'*, *e* into *e'*; *c* falls upon *c'*, and the two halves form in the centre *e'* a space or mould in which the type is formed: the matrix *M* is placed at the bottom of the mould, and is retained in its place by the spring *s*, and the extent to which the two parts of the mould slide upon each other is determined by the width of the matrix. The metal is poured in at the orifice formed by closing the upper parts, and the newly-cast letter cannot be disengaged without opening the mould: the letter is removed from the mould by bringing down one of the hooks, *h*, to the waste part attached to the base of the letter.

In casting the letters, with the assistance of this little piece of apparatus, the caster stands by the side of a furnace containing

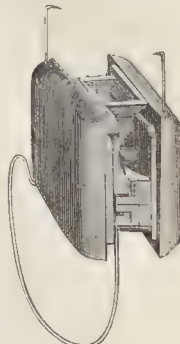


Fig. 262.

the melting-pot with the type-metal in a fused state. This consists of an alloy of lead and antimony varying in composition with the size of the type. For the smallest, hardest, and most brittle types, the alloy consists of three parts of lead to one of antimony; for small hard brittle types, four lead to one antimony; for types of medium size, five lead to one antimony; for large types, six lead to one antimony; and for the largest and softest types, seven lead to one antimony. Small types, however, contain from four to six per cent. of tin, and sometimes from one to two per cent. of copper. The caster, standing before the melting-pot with the mould in his left hand, and a small ladle in his right, takes up a quantity of the molten metal, pours it into the mould, which he jerks upwards for the purpose of expelling the air from the cavity, and driving the metal into the finest stroke of the matrix. He then releases the spring, opens the mould, and hooks out the letter, which has the appearance represented in Fig. 263. A good caster will cast about five hundred letters per hour of ordinary sized type, the small and the large sizes requiring more time. A boy is employed to break off the superfluous metal from the types, after which they are rubbed on a slab of gritty stone to remove knobs or globules from the sides. The letters are next set up in a long, shallow frame, with the faces uppermost and the nicks outwards. They are then polished on each edge, when, being turned with the face downwards, the bottom is planed and a groove formed, which brings the type to the required height, and enables them to stand steadily. The letters are next carefully inspected with a lens, after which the fount is proportioned, that is, the proper portion of each letter, together with the spaces, quadrats, &c., are counted out, and each letter is tied up in lines of convenient length for the printer. A complete fount of pica weighs eight hundred pounds.

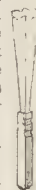


Fig. 263.

When a new fount of type is received at the printing-office, the first operation is to lay it in cases, of which there are two, the upper and the lower, Fig. 264. The upper case contains a number

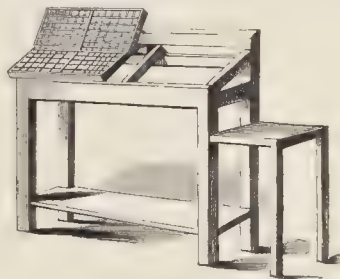


Fig. 264.

of equal spaces or boxes, the left-hand division containing capital letters, dotted letters, figures, fractions, and a few other particular sorts; while the right-hand division contains small capitals, accented letters, note references, &c. In the upper case the letters and the figures are arranged in proper order from left to right. In the lower case the divisions are unequal, those letters that are most in request occupying the largest divisions: thus the letter *e*, has the largest box; *c*, *d*, *m*, *n*, *h*, *u*, *t*, *i*, *s*, *o*, *a*, *r*, have each boxes of twice the size of the letters *b*, *l*, *v*, *f*, *g*, *y*, *p*, *w*, and four times the size of *z*, *x*, *j*, *q*, or the crochets *¶*, points and full-points, double and treble letters, &c. The letter *k*, occupies a spare box in the left-hand division of the upper case. Italic letters are in a separate case.

The compositor, standing before the case with his copy, as the author's manuscript is called, takes in his left-hand a *composing-stick*, Fig. 265, fixes the length of the line by means of the



Fig. 265.

inner movable portion, and then takes a piece of brass, called a *setting* or *composing-rule*, of the exact length of the line, and furnished with a projecting ear for lifting it out of the composing-stick, where it serves the purpose of allowing the letters to slip easily into their places. The compositor begins his work by reading a portion of his copy, and carrying a line or two in his mind. He takes a capital letter from the upper case and places it in the left angle of the composing-stick; he takes the remaining letters of the first word from the lower case, and at the end of the word inserts a *space*, which is merely the shank of a letter without any face, and not so high as a letter by one-fourth. He proceeds in this way until he gets to the end of a line, making the words and spaces exactly fill it, or properly dividing the last word according to its syllables. Correct spacing requires considerable skill, and is one of the tests by which the good compositor is distinguished from an indifferent one. At the end of the first line the compositor takes out the setting-rule and places it in front of the line just completed, and proceeds to compose a second line, which being completed, the setting-rule is put in front of it, and so on with the remaining lines. If the matter is to be *lead*, that is, if the lines are to be further apart than the type alone will allow, a flat metal band, called a *lead*, of the length of the line, of the height of the spaces, is inserted after the completion of each line and before the setting-rule is removed. The page may be *thick-led* or *thin-led*; in the one case two or three leads are inserted between every two lines, in the other case only one is used.

The compositor works with considerable rapidity; long practice has made him familiar with the localities of the various letters, and he selects them one by one without looking at their faces, the nick in each type enabling him to place the letter in its correct position in the composing-stick. When this is full he takes out the composed matter, consisting of 6, 8, 10, or 12 lines, and deposits it in a long frame called a *galley*, Fig. 266, for which purpose the setting-rule laid on the last line allows the whole of the matter in the stick to be grasped tightly between the fingers and thumbs of both hands, and so removed.



Fig. 266.

This requires some practice, for if not properly grasped the *stickful* of type will fall to pieces, and make what, in the language of the printer, is called *pie*. When enough matter has been collected in the galleys, the compositor begins to make it up into pages, for which purpose he selects the proper number of lines, and adds at the bottom a line of quadrats, which resemble spaces, but are much larger; he next places at the top the folio and the running head, or line, which indicates the title of the work, the subject of the chapter, or, still better, of the page. At the bottom of the first page he places the *signature*, or letter of the alphabet which serves as a guide in *gathering*, *folding*, and *binding* the sheets. The page thus formed is tied round with string, or *page-cord*, and placed on a piece of coarse paper. Having made up as many pages as the sheet consists of,—4 for folio, 8 for quarto, 16 for octavo, &c.,—he places them upon a slab of marble let into a frame, called the *imposing-stone*. He then takes an iron frame called a *chase*, which is divided by cross bars into compartments, and places it over the pages, adjusting between them a number of pieces of wood, or metal, called *furniture*; within the chase next to the pages he places other pieces of iron called *side* and *foot-sticks*, which are rather wider at one end than at the other, and between this and the chase he drives in small pieces of wood, called *quoins*, which decrease in width in the same proportion as the side-sticks. By means of a mallet and a stick, called the *shooting-stick*, he drives the quoins towards the thicker end of the side and foot-sticks, and the quoins thus act with the gradual force of the wedge, driving the separate pieces of type together, so that all the sides of the pages being many times *locked-up*, the whole mass, consisting of

many thousand letters, may be lifted off the stone like a solid body; this united mass is called a *form*, and there are of course two forms to every sheet, the *outer* and *inner* form. Fig. 267 represents the forms of an octavo sheet.

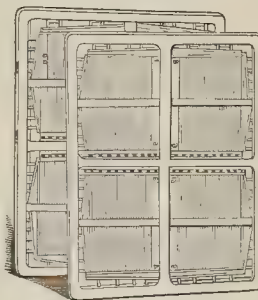


Fig. 267.

When the two forms have been prepared they are conveyed to a hand-press, and a proof of the sheet is *pulled*. This proof is taken to the *first reader*, or *corrector of the press*, who folds the sheet, examines the signature, the folios, the running heads, &c. A *reading-boy* then rapidly reads the copy, and the reader makes such corrections in the margin of the proof as are required. The sheet is then returned to the compositor, who, having made the necessary corrections, pulls another proof, which, being compared with the first proof and found satisfactory, is sent to the *second reader*, who subjects it to an intellectual as well as technical revision, and often confers great benefit on the author by the useful queries and suggestions made in the margin. The proof is now sent to the author, who reads it, makes his own corrections, and returns it to the printer; these may be more or less extensive, according to the nature of the work and the experience of the writer; but, whatever they are, they form the subject of a separate charge on the part of the compositor. With all the care of readers and of the author, mistakes frequently creep into the work, and are often not detected until the edition is published; some of these mistakes are of an amusing description. There is an edition of the Bible known as the "*Vinegar Bible*," from the circumstance that in the parable of the vineyard the word "*vinegar*" was printed instead of *vineyard*. In a treatise on light we described a beam of light as consisting of "*innumerable bundles of rays*." The printer converted this expression into "*bundles of rags*." Any one connected with the press might easily collect from his own experience a large number of blunders of this kind, which, though amusing enough to read when made into an essay by a pleasant writer (such as the elder "*D'Israeli*" has done in his "*Curiosities of Literature*"), are mortifying to the author to discover when too late for correction. Careless reading of the press leads to long lists of *errata*, and in some French scientific books we have pages of *supplementary errata*, and we have even noticed an *erratum of the errata*. When the author is satisfied with his proof, or with the *revise* thereof, it is returned marked "*for press*." This "*press-proof*," as it is called, is once more read with a view to weed out any remaining technical errors, to correct the spacing, to take out defective letters, &c.; and at length, all corrections having been made, the reader marks on the proof the number of copies to be printed, and sends it to the press-room.

The earliest form of printing-press was nothing more than an ordinary screw-press, with a contrivance for running the inked form under the screw. This was a slow process, and there was danger of injuring the face of the type from the mode of applying the force. The first great improvement in the printing-press was effected by a mathematical-instrument maker of Amsterdam, named *Blaew*. It is represented in Fig. 268. The two upright posts *u u* are bound together by four horizontal bars; the top one *e* is called the *cap*, the second *h* is the *head*, and is held by tenons and mortices, and is also suspended from the cap by screw-bolts *s s*, and in the centre is a brass nut containing a hollow screw, or worm, for receiving the upper end of the large screw by which the pressure is produced. The third bar *t*, called the *shelf*, or *till*, is intended to guide the *hose h'*, which contains the spindle and screw. The next

cross bar *w*, called the *winter*, is for supporting the carriage. The spindle and screw *s* is a vertical bar of iron, the lower end of which is of steel, while at the upper end is a small screw which works in the small brass nut at the head, and in the eye of the spindle, just below the upper end, is fixed the handle *h*, by which the press is worked. Under the spindle is the *platten*, which imparts the pressure to the paper. It is suspended from the point of the spindle by the *hose* *h'*, a square frame or block of wood which passes through the shelves. The lower end of the spindle passes through the hose, and its point rests in a plug fixed in a brass cup containing oil, which is fixed to an iron plate let into the top of the platten. By pulling the handle *h*, the pressman turns the spindle, the round of which moves in its screw box, and by its descent brings down the platten, which thus presses on the paper lying on the form of type. The platten is suspended from the spindle, and rises up again with it by means of a fillet of iron screwed to the hose, and entering a groove round the upper part of the spindle; the platten hangs truly level by four threads passing from its four corners to the four corners of the lower part of the hose. The form of type *r* is conveyed under the platten by means of a carriage *cc*, which is supported on a horizontal wooden plane, the fore part being sustained by a fore-stay, while the back part rests on a winter. Below the plank of the carriage are short *cramp-irons*, which slide upon two long iron bars fixed on the upper part of the horizontal wooden frame. To run the carriage in and out on this frame, there is below the carriage the *split*, or small spindle with a double wheel on the middle of it, round which are fastened leather belts, the opposite ends of which are nailed to each end of the plank of the carriage. On one of the ends of the split is the *winch* *w'*, by turning which the carriage can be run out and in. The carriage is a strong wooden plank, upon

which is fixed a square wooden frame forming the *cell*, in which is placed a polished stone for sustaining the form. To this cell are fixed *stay-belts*, one end attached to the cell, and the other to the cheeks of the press, to prevent the carriage from running out too far when drawn from under the platten. On the outer end of the plank is fixed the *gallows* *g* for supporting the *tympans* *r'*, when they are turned up to receive a new

sheet of paper after each impression. The tympans are light square frames covered with parchment, and so constructed that the one represented as the upper one in the engraving shall lie within the exterior one, to which it is fitted by iron hinges. Between the two tympans are placed two or three folds of blankets, for the purpose of equalising the pressure of the platten upon the surface of the types. A square frame of thin iron, called the *frisket*, *tt*, is attached by hinges to the headband of the exterior tympan, and is made to fall down upon the tympan so as

to inclose the sheet of paper which is to be printed between them. The tympan and the frisket being thus folded down, lie flat on the form of types, and the carriage containing them is run between the platten, so that, when the handle is pulled, the platten presses on one half of the form of types; the carriage is then run further in with the other half of the form of types: and in this way, by means of two separate pulls, the impression of the types is made upon the paper. By turning a winch *w*, the carriage is withdrawn from

beneath the platten, and the tympan, being lifted up, is made to rest against the gallows: the frisket is then raised, and rests against a slip of wood descending from the ceiling, when the printed sheet is taken out and a fresh sheet put in. Every time the carriage is run out, the sheet is inked by means of two bulky *inking-balls*, consisting of two circular pieces of pelt covered with composition, stuffed with wool, and nailed to wooden stocks. One of these balls, *b*, is shown in the *ball-rack*, and the other, *b'*, on the *ball-block*, which contains the ink heaped up in the angle, but brought gradually down to a thin layer in front of the block. We have described this press thus minutely since every lover of books will recognise it as a valuable old servant, which has done good service in its time. By its means the works of the greatest men of modern times have been propagated, and the masterpieces of antiquity distributed to the world; it continued to

perform its useful offices up to the commencement of the present century, when it was superseded by better mechanical contrivances. Those who are interested in such matters will remember, in the Great Exhibition of 1851, one of Blaew's presses rearing its lofty head, dark, dingy, and discoloured with the service of many years, but not ashamed of its more prolific rivals and neighbours; for truly it might say, "I have done my duty to the best of my power, do you continue to do yours."

The chief improver of the hand printing-press was the Earl of

Stanhope, whose press is represented in Figs. 269 and 270, in which *B B*, the body of the press, is a cast-iron frame in one piece attached to a wooden cross *w'*. Two horizontal rails are screwed at *pp*, Fig. 270, to two projecting pieces cast with the body for sustaining the carriage when the pull is made. The ribs of the carriage slide in grooves on the upper surface of these rails, and are moved by the handle *w*, with the split and lea-



Fig. 268.—COMMON PRINTING-PRESS.

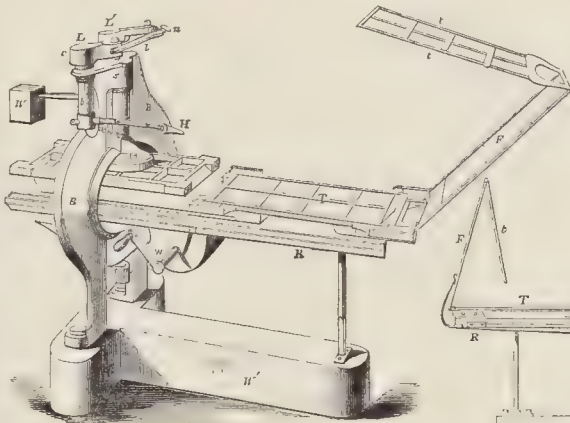


Fig. 269.

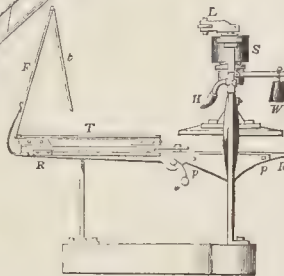


Fig. 270.

ther, as in the old press. A brass nut or hollow screw is fixed on the upper part *s* of the body of the press, in which the upper end of the spindle works. This screw is attached above *s* to the rim *L L*, while the toe *c* of the screw fits into a cup attached to a piece screwed to the plank. A handle *h* for working the press is firmly fixed into the lower end of the bar *b*, the lower point of which moves in a hole in the principal frame, while the upper end passes through a collar in the projecting piece; being passed through this collar, the end of the bar joins a

short lever, which is connected by a link *l* with another short lever *r* fixed on the upper end of a screw. The pressman in pulling the handle turns round the spindle, and by its connection with the rod *c*, &c., the great lever turns with it, and causes the platten to descend and produce the required pressure. The power of the lever *H* is transmitted to the screw in such a way as to produce the required effects. After the impression is made, the platten, which is of considerable weight, is raised from the form by means of a balance-weight suspended on a lever and hook at the back of the press, and thus brings the bar-handle back again ready for another pull. The form of types rests upon a cast-iron block, and the press is of such a size that a whole sheet can be printed at one pull. The advantages of this press over the old form are too numerous to be pointed out here, nor would they be of sufficient interest to the general reader, any more than the numerous variations and improvements which have been made from time to time. Such a press as we have described is worked by two men, one of whom inks the type and attends to the impression, while the other works the press. The inner form is first laid on the table, and is secured in the centre by means of quoins. A sheet of stout paper is pasted on the frisket-frame, and also secured on the tympan. The form being inked an impression is taken on the frisket, after which all the printed part is cut away, the use of the portion which is left being to protect the paper from soiling. A sheet of paper is next folded according to the crosses of the chase, and being placed on the form, it is carefully opened, so as to lie evenly on the form with the same margin that it is to have in the working. The tympan being wetted, is closed down on the form, and an impression is taken, when the paper adheres to the tympan, and serves as a guide for laying on the sheets which are to be printed. The points are next selected; these are pointed wires fixed in the tympan; they perforate the sheet, and thus serve as guide marks to the pressman. The tympan-frame is arranged so that the points may fall into the cross of the chase. The paper is now brought from the wetting-room, where it has been damped by passing it, one-fourth or one-fifth of a ream at a time, through water, and allowing it to remain two or three days till it is evenly damp throughout. A ream of paper is now laid on an inclined plane called the *horse*, placed on the left end of a long table called the *bank*, and as the paper is worked it is brought from the tympan to the bank. The man takes a sheet, lays it carefully over the tympan sheet, closes the frisket over it, shuts down the tympan and frisket upon the inked form, runs the table under the platten, pulls the handle of the lever until it is brought down by the stop, when the platten descends and produces the impression. Gradually releasing his hand, the balance-weight raises the platten, the bar returns to its first position, the table is run out, the tympan and frisket raised, and the frisket is thrown up. The sheet is taken off the points and examined. The first impression is generally defective from the unequal thickness of the parchment lining of the tympan, or of the blanket, or from the slight inequalities in the height of the type. The defects are remedied by over-laying or pasting pieces of paper on the tympan where the impression is too faint, and rubbing or cutting away where it is too strong. When a favourable impression is taken, the whole number is worked off; the inner form is then removed, washed with lye, and sent to the composing-room, where it is again washed, rinsed, and distributed. This last operation constitutes one of the peculiar advantages of printing with movable types, for the letters being now returned to the cases can be used over again for setting-up fresh matter. In distributing, the compositor holds a quantity of the composed type in his left hand with the face towards him, and taking up one or two words between the fore-finger and thumb of the right hand, drops the letters into their proper boxes with great rapidity. But to return to the pressmen, who are now laying on the outer form with as much care as the inner, and, having obtained a satisfactory impression, they proceed to *perfect*, or complete the sheet by printing on the other side. In this operation the points insure what is called *perfect register*, whereby the pages and lines fall exactly on the back of each other. When the impression of the outer form is brought up, a sheet of thin white paper, called the *set-off sheet*, is placed over the tympan sheet, and is frequently changed, so that the impression may be kept clean. Two good pressmen will work one *token* or two hundred and fifty impressions in one hour, but this varies greatly in the kind of work. For very fine work and with wood-engravings not more than fifty impressions per hour

may be produced, an extra amount of care being required for fine work. The wood-engravings are imposed in the chase and are locked up on the table of the press; they are worked in the same manner as type, but require more care. The balls formerly used for inking the type did their office in an unequal and imperfect manner. Some parts of the impression being pale from the defect of ink, others too black from an excess thereof; these two opposite defects were called *friars* and *monks*. The inking-roller, Fig. 271, is now commonly in use; it is supplied with ink from an inking-table, Fig. 272, and contains a trough of ink and a distributing roller, shown separately in the figure. The trough of ink is pressed up to the distributing-roller by means of balance-weights: on turning the distributing-roller it presents a line of ink, which the man takes up with the inking-roller, and distributes it carefully on the table until the whole face is evenly covered; he then rolls the form with an equal, light, and steady motion.



Fig. 271.

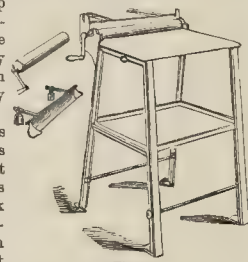


Fig. 272.

The printer's ink-maker forms a distinct trade; this ink differs essentially from writing-ink, it being an oily while the other is a gummy compound. The black colour is produced by lamp-black, the finest quality of which should be used, and the oil, nut or linseed, should be boiled and burnt into a varnish. The ingredients should be well mixed, and ground until quite impalpable, so as not to clog the types or tear the face of the paper. Turpentine is added to promote the drying; indigo or prussian-blue are sometimes added to improve the colour.

When the sheets are worked off, they are hung upon lines to dry, for which purpose a wooden peel, Fig. 273, is used. The drying must not be hurried, or a skin will form on the surface of the letters, and keep the under part of the ink wet, and when the sheets come to be pressed, rolled, or beaten, the filmy skin breaks, and the ink spreads and *sets off* on the opposite pages. After a day or two, the sheets are taken down and laid in heaps, or they are arranged for gathering, or they are *hot* or *cold-pressed*.

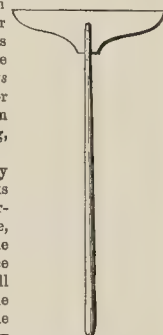


Fig. 273.

We have thus far described printing by hand, which still continues in use for works like the present, where engravings and letter-press are combined. For periodical literature, and for cheap books of large circulation, the *printing-machine* has rendered signal service to the intellectual progress of the age, as well as to that political progress by which the liberties of a great nation are secured. If the *Times* newspaper, which is now printed by Mr. Applegath's splendid vertical machine at the rate of 13,000 impressions per hour, had depended upon the pressmen with their 300 or 400 impressions per hour, it is not too much to say that the progress of this country in morality, general intelligence, commerce, wealth, and all those elements which constitute an advanced state of civilisation, would have been greatly retarded. It is true, that with our great facilities for printing other great social improvements have kept pace. The steam-engine, which has lent the aid of its mighty arm to the printing-press, has also greatly assisted in promoting intercourse between the people of the same nation and those of different nations. The electric telegraph has performed still greater wonders by bringing persons who are separated hundreds, or even thousands, of miles within speaking distance of each other. Improved sanitary arrangements—an increased interest for each other among the different classes of the community, show that, notwithstanding the strongly developed money-getting propensity of the age, we are as a nation advancing

in our obedience to the Divine command, "Thou shalt love thy neighbour as thyself."

It would occupy too much of our space to go into the details of the printing-machine, we must rather direct our attention to some of the ornamental varieties of printing which adorn the Stationery Court. Among these, coloured lithographs are conspicuous. We will notice the method of multiplying these productions after having given a few details respecting the elder branches of the art—viz., *chalcography*, or copper-plate engraving, from two Greek words signifying *copper*, and *I inscribe*; *xylography*, from two Greek words signifying *wood*, and *I inscribe*; while engraving on stone is called *lithography*, from the Greek for a *stone*, and *I inscribe*.

The ornamentation of metals by means of engraving is very ancient; but the method of filling up the engraved lines with ink is a modern invention, and is ascribed to one Finiguerra, a native of Florence, who lived in the fifteenth century. He was skilful in the engraving of church ornaments and other articles *in niello*, as it is called; that is, filling up the engraved parts with a black composition of silver and lead. It is stated that on one occasion Finiguerra having cast some melted sulphur on his engraving to try its effect previously to putting on the black composition, observed on removing the sulphur that some dust and charcoal which had gathered in the hollows gave an impression of his engraving. This led him to try the effects of moistened paper pressed down upon the engravings with a roller, and he found that he could thus obtain an impression. Other goldsmiths practised the art, and it soon attracted general attention from the facility with which copies could be multiplied by this means. The art led to the production of book-books, and very soon to printing by means of movable types.

Copper-plate engraving in its simplest form is carried on in the following manner. A smooth, level, highly-polished plate of copper is selected, and on it the outlines of the subject to be engraved are accurately drawn, for which purpose the plate is heated sufficiently to melt white wax, a piece of which is rubbed over it so as to form a thin layer. A tracing of the original design having been made on tracing-paper with a black-lead pencil, this is laid down upon the wax surface with the lead lines in contact with it. By means of heavy pressure the lead lines are transferred from the paper to the wax. The engraver then removes the paper, and with a fine steel point goes over the subject lightly, so as just to penetrate the wax and touch the copper. In this way an outline of the subject is drawn on the plate, and when the wax is melted off, the subject is completed according to the skill of the engraver. His chief instrument is the *graver* or *burin* of steel, ending in an unequal-sided pyramidal point.



Fig. 274.

This instrument is held in the hand at a small inclination to the plane of the copper, as in Fig. 274, and is pushed forward in the direction required to cut the lines on the plate. Should the lines be cut too deeply, a smooth tool called a *burnisher* is used to soften them down. The graver, in ploughing furrows in the copper, raises correspondent ridges, or burs; these are scraped off with a steel *scraper*. A woollen rubber is also used with olive-oil to clear the face of the plate, to show the progress of the work, and to polish off the burr. Writing engravers use a leather bag filled with sand as a cushion to support the plate during the progress of the work. Parallel lines for skies, &c., are put in with a ruling-machine. Such is the old method of engraving, and it is still adopted for letters, silver-plate, &c., but for artistic subjects it has given way to the freer and more expeditious process of *etching*.

Etching is the process of corroding with aquafortis the lines of a drawing traced out with an etching-needle on the copper-plate, over which has been previously placed an *etching ground*, or composition of bee's-wax and Burgundy-pitch, on which the strong acid has no action. The composition is made up into balls and tied up in pieces of plain worn-silk; the plate being heated, one of the silken balls is rubbed over it, and the warmth causes the composition to ooze through the silk. The ground is then equalized with a *dauber* of lamb's-wool, tied up in soft, fine muslin in the shape of a flattened ball, and covered with black silk. The etching-ground being smoothly and equally distributed, the copper-

plate is held, face downwards, over the flames of two or three wax candles tied together, and moved about so as to blacken the whole surface. The design being made in outline with a black-lead pencil on a piece of thin, even paper, and placed face downwards on the smoked surface, the whole is passed through a roller-press, whereby the outline is transferred to the ground. The design is then etched-in by means of needles, a very fine point being used for the more distant and delicate parts, and a broader one for the nearer and bolder objects. The needles remove the wax composition or etching-ground from the copper wherever they pass, and slightly scratch the surface of the plate, so that when acid is poured upon it, the parts that have been scratched are exposed to its action. To prepare for the acid, a border of *banking-wax* half an inch high is put round the plate, and the acid is poured into the trough thus formed, and left for a time, which must be regulated by experience. The acid being poured off, the plate is washed with water, and the fainter parts of the subject are *stopped*, or varnished with a composition called *stopping-ground* of lamp-black and Venice-turpentine applied with a camel's-hair pencil, which prevents the acid from acting upon those parts when poured on a second time. The repeated action of the acid is for the bolder parts of the subject, and the stopping-out and biting-in can be repeated as often as the subject may seem to require it, so as to produce various gradations of tint. The wax border is then removed by heating the plate, and the etching-ground is wiped off with a rag moistened with olive-oil. The work is then touched up by hand with the graver. Etching-points or needles resemble common needles fixed in handles four or five inches long. Some are of an oval form, so as to produce the broader lines. What is called the *dry point* is the common etching-needle brought to a very fine point for the purpose of cutting or serrating the more delicate points of skies, &c. The dry point raises a slight ridge or burr, which is not removed with the scraper, but is left on with fine effect. In some of Rembrandt's etchings, the burr was left on till it wore away in the printing; hence the early impressions of his etchings, where this peculiarity is visible, are much valued. Imitations of chalk and pencil-drawings are sometimes produced by etching on soft ground; but this practice has been superseded by lithography. Etching on steel is performed in the same way as on copper, but the steel gives a larger number of good impressions. A kind of etching is also used in the representation of medals, for which purpose a machine is used. Etched imitations of chalk-drawings of the human figure, called engravings in *stipple*, are executed in dots, which are afterwards bitten-in with aquafortis. These dots may be harmonised with a small hammer, when the work is known as *opus mallet*. In mezzotints a dark bar or ground is raised uniformly by means of a toothed instrument, and the design being traced, the light parts are scraped off according to the effect required. In aquatinta the outline is first sketched, and then a sort of wash is laid on with aquafortis, producing the effect of Indian-ink drawings.

Steel engraving resembles copper-plate engraving, but it has this peculiar advantage, that the plate can be engraved on in its soft state, and having received the finishing touches of the hand of genius, can then be hardened and printed from to an unlimited extent. It can even be used for multiplying steel plates resembling itself. For this purpose the subject is engraved either by hand or mechanically, or the two methods may be combined on a plate of soft steel: the plate is then hardened. A cylinder of decarbonised steel is next rolled over the hardened plate with strong pressure until the engraved impression appears in relief, the hollow lines of the original being raised on the cylinder. The roller is then brought back to the condition of ordinary steel, and is hardened, after which it can be used for returning the impression to any number of decarbonised plates, each of which thus becomes a counterpart of the original plate. It is stated that each of these plates, when hardened, will give 150,000 impressions without being materially worn. The original plate thus serves to give one impression to the transfer-roller, which in its turn is used to produce any number of plates. The plates are decarbonised by being heated in contact with iron filings, and they are reconverted into steel by being heated in contact with fine charcoal made from leather; when taken out of the fire the plates are plunged into cold water.

The Chinese, to whom we owe many of the useful arts, appear to have practised wood-engraving at least as early as the tenth century. Native Chinese literature has been perpetuated by

means of this art, the characters of a whole page being engraved upon a single block; for, where words of a language are made up for the most part of arbitrary characters rather than of an alphabet of separate letters, much difficulty would be found in the use of movable type. In their intercourse with the Chinese, the Venetians appear to have learnt this art, and from them it was taken up by Germany and the Low Countries for the production of playing-cards and prints of saints. This was early in the fifteenth century, when the engraver on wood was called a *formschneider*, or figure-cutter, a term still in use. The prints of saints were sold separately, but in the course of time they were pasted into religious books, and hence probably arose the custom of illustrating books with wood-engravings. One of the earliest block-books is the *Biblia Pauperum*, or Bible of the Poor; it consists of 40 leaves, small folio, printed from the same number of engraved blocks of wood on one side of the paper only. These prints are placed two by two, facing each other, so that by pasting their backs the book has the appearance of being printed in the usual way on both sides.

The art of wood-engraving, with a few artistic exceptions, long continued in obscurity; but the necessity in modern times for illustrated works, in which wood-engravings and letter-press mutually assist each other, has led to such improvements in the art that it may now be said to have attained perfection. The wood employed for the purpose is box, chiefly of American or Turkish growth, which is sufficiently hard and close in the grain for the purpose. It must be well seasoned, cut into blocks of such a thickness as to correspond with the height of the type, and the surface must be nicely smoothed and polished. Before drawing upon it, it is usual to wash over the surface with gum-water containing a little flake-white. The artist on wood must be acquainted with the peculiarities and resources of the art, and must give such effects only as the material is capable of expressing. In copper-plate or steel engraving, lines may be crossed in various kinds of etchings, and effects may be produced by means of dots. In wood-engraving, however, where the lines, instead of being ploughed in, or the dots sunk, are raised and left in relief by the cutting away of the surrounding material, the crossing of lines and the production of dots are difficult, if not impossible. The principal tool employed in wood-engraving is the graver, and it resembles the tool used in copper-plate engraving. The point, however, is ground to a peculiar form by rubbing on a Turkey-stone. Eight or nine different sizes

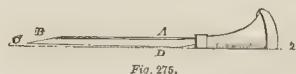


Fig. 275.

are used, the finest being the outline tool; the upper part A, Fig. 275, is the back, the lower part D is the belly, B is the face, C the point. This tool, in common with the others, is fixed in a handle with a rounded end, part of which is cut off to allow the tool to rest in the proper position of the hand when taken up. Fig. 276 shows the other gravers. The lower dotted line shows the extent to which the points are usually ground down. For



Fig. 276.

tinting, which is done by cutting parallel lines, thinner tools are usually employed; these are shown in Fig. 277. The faces of these graving-tools should be long, so that the shaving of wood may turn gently over towards the hand, as in Fig. 278, whereas, if the graver be too obtuse, the shaving, instead of turning



Fig. 277.

aside, coils up before the point of the tool, as in Fig. 279, and hides the pencil-line which the engraver is following. Gouges of

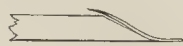


Fig. 278.

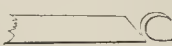


Fig. 279.

different sizes, Fig. 280, are also used for scooping out the wood

towards the centre of the block, and flat tools, or chisels, for cutting it away towards the edges. The flat tool marked c is objectionable, as the projecting corners are apt to cut under the line. The graver is held, not as in copper-plate

or steel engraving, where the fore-finger is extended on the back of the tool, so as to press the point into the plate, as shown in Fig. 273; but, on the contrary, the force of the hand has to be checked by the thumb, which, in small subjects, is rested against the side of the block, allowing the blade to move freely, but ready



Fig. 280.

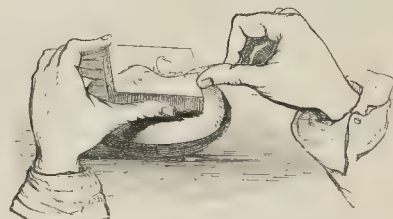


Fig. 281.

to check it in case of a slip, see Figs. 281, 282; in larger subjects the same object is obtained by resting the thumb on the surface of the block.



Fig. 282.

Wood-engraving requires artistic feeling, a steady hand, and a good eye. Some artists use a lens for the finer parts of their work, but this should be avoided unless absolutely necessary. In working by lamp-light the heat of the flame is got rid of by placing a glass globe filled with water between the light and the block; by this means one lamp will serve for three or four persons, and each will have a clear, cool light to work by. During the engraving the drawing is usually protected by a piece of paper, folded down and secured at the sides, portions of this paper being removed from time to time, as the work proceeds.

Lithography depends on the simple principle that resinous or oily substances will not combine with aqueous, or gummy ones. Now, if a stone of smooth texture and absorbent surface be prepared first with an aqueous or gummy ground, and drawings be made on this with a resinous or oily substance, the latter will adhere strongly to the stone, and not be affected by water poured over it, while the other parts of the stone imbibe it readily. If, however, a resinous or oily body be passed over the stone, it will adhere strongly to the drawing, and not to the watery parts of the ground. The stone used in lithography is a kind of calcareous slate from the banks of the Danube, in Bavaria; it is of a pale yellowish drab colour, brittle, and porous. The face of the stone is prepared by grinding two stones together with fine sand interposed. Much care, however, is required to produce a uniform surface, and the grained stone, as it is called, thus prepared is used for drawings in the chalk manner, or for imitations of pencil drawings. For writings, imitations of etchings, pen-and-ink sketches, &c., the face of the stone is polished with pumice-stone dust, and water applied with a rag. The materials used for drawing, writing, &c., are lithographic chalk and lithographic ink. They are composed of tallow, white wax, soap, shell-lac, and lamp-black, incorporated by burning in a covered vessel over the fire, the proportions being different in the chalk from the ink. The mixture is cast in a mould in the form required for use; the chalk is used dry, but the ink is dissolved by

rubbing it up with water, and is used with a pen or hair pencil, soap enabling it to combine with the water. When the drawing is made on the stone, it would for this reason admit of being washed out with water; but it is fixed by passing over the stone a weak solution of nitric acid, which combines with the alkali of the soap, and renders the ink insoluble in water. A solution of gum is then floated over the whole face of the stone, and when this is removed the surface is ready for printing. A roller covered with printing-ink being passed over the stone, the parts wetted with water will not even be soiled by the printer's ink, but the lines of the drawing will take up a sufficient quantity to transfer an impression to a sheet of damp paper placed on its surface, and passed with the stone through a roller-press. After every impression a wet sponge is passed over the stone previous to applying the inking-roller, and in this way many thousand impressions can be taken.

Fac-similes of letters, &c., can be made by means of *transfer-paper*, which is prepared by being washed with a gummy solution, and is written on with lithographic ink. If this writing or drawing be placed on a polished stone, and the back of the paper being wetted, the whole be passed through the press, the writing will be transferred to the stone; and, the paper being removed, and the gum which prevented the ink from sinking into the paper being washed off with water, the stone can be printed from as before.

A method called *etching*, or *engraving on stone*, is performed by rubbing over a polished stone a coat of gum-water containing some lamp-black, or vermilion. This prevents the stone from taking grease or printer's ink. If, however, a drawing be executed with an etching-needle by scratching away portions of the gum-ground, and some oil be then rubbed over the stone, the parts exposed by the etching-point will alone imbibe the oil, and, on washing off the gum-ground, the surface can be printed from as before.

By printing with two or more stones, a great variety of effects may be produced. For example—in printing a landscape, the drawing is made with chalk on a grained stone, the sky and other delicate tints being omitted—these are afterwards added by the *tint-stone*. The latter is polished, and the ink used is peculiar. The extreme lights can also be scraped out, and care being taken with the *register*, the effects of the tint-stone can be added to those already given to the paper by the other stone. On this principle, by using various stones, coloured lithographs are produced, coloured inks being used, with a separate stone for each colour.

Letter-press printing in various colours, or *chromotypy*, as it is called, is seldom practised, except for the red-letter days in almanacs, and the rubric in superior editions of the Church of England Prayer-book. Some of the early printers retained the services of the illuminator, who inserted titles, initial-letters, &c., in crimson, blue, and gold. When the art of illumination was no longer a profitable employment, the printer sometimes attempted its effects by the use of variously coloured inks; but as each form requires to be passed through the press as many times as there are coloured inks, this mode of printing becomes expensive. For example, in printing the red-letter days, the sheets are passed through the press with the omission of the red matter, the exact space which it fills being occupied by quadrats. In the second working the red matter alone is set up, and the difficulty is to preserve accurate register where so small a portion of red has to be inserted in so large a body of black. The difficulty is, of course, increased as the number of the colours becomes multiplied. The coloured inks require careful preparation, and before being used they must be worked up with varnish on a stone with a muller to the required consistency. The ink is applied to the type usually with a ball. If a form consist of pica, small-pica, and long-primer of different colours, the prevailing colour—the pica, for example—is worked first, and the lines in pica are set up, and the other lines are filled in with small-pica and long-primer quadrats. When the second set of lines is to be worked, its quadrats are taken out and the proper letters inserted, while the type of the first lines is removed, and quadrats substituted. A similar plan is adopted for the third lines; and in making these changes the form must not be disturbed in its place on the press; care must also be taken, in this treble working, not to disturb the points in the tympan. The paper must not be allowed to dry between the different workings, or it will shrink and the register cannot be afterwards obtained. The composition of coloured inks has of late years been greatly benefited by the improvements which have been effected in the manufacture of those foolish things playing-cards.

Printing in gold is performed by setting up the type in the usual manner, and causing leaf-gold to adhere to the paper when the impression has been taken in varnish. The gold leaf is rubbed on with a piece of cotton wool. For inferior gold printing bronze powder is used, and a very large trade is carried on in this branch of the art at Manchester for ornamental tickets, which are attached to muslins and calendered goods.

Before proceeding to notice other kinds of printing, the results of which are exhibited at the Stationery Court, we may shortly describe the *rolling-press* used in copper-plate printing and for other purposes. It consists of two parts, the *body* and the *carriage*; the body is formed of two cheeks of wood or of iron placed vertically on a stand or foot which supports the whole machine. From this foot proceed four other vertical pieces joined by horizontal pieces supporting a strong even plank of wood called the *table*; within the cheeks are two rollers, the upper one of iron, and the lower of wood. These rollers run on the cheeks or gudgeons, formed by turning down the ends of the rollers on two pieces of wood in the form of half-moons, lined with polished iron to assist their motion. One of the gudgeons of the upper roller carries a cross consisting of levers, as shown in Fig. 283, by means of which motion is given to



Fig. 283.

the upper roller. The space between the upper and lower rollers can be adjusted by screws.

In the process of printing the copper or steel plate is raised to the temperature of 160° by means of a charcoal fire, or a steam-box, which is much preferable, by thus getting rid of the dangerous charcoal fumes. The man takes up a small quantity of ink on a rubber, and daubs it over the face of the plate; he then removes some of the superfluous ink with a piece of canvas, and with the palm of the hand dipped in whitening he clears away the ink from those parts which are not engraved, while a proper supply of ink is left in the hollows. The plate being once more warmed is placed on the plank of the press, and over the plate the damped paper which is to receive the impression, and over the paper two or three folds of flannel or blanket. The arms of the cross are now pulled, and the plate with its furniture are passed between the rollers, which by their strong equable pressure force the moistened paper into the strokes of the engraving, by which it absorbs the ink and retains the impression. Three kinds of ink, the *thin*, the *thick*, and the *strong*, are in use; they differ in their degrees of cohesion, the strong being used for the finer works. The stronger the ink, the stronger must be the impression.

The *lithographic-press* differs from the copper-plate-press in the mode of applying the pressure, which is accompanied by a sort of scraping movement. In this press there are two iron uprights rising from the bed or table, and the stone is supported by a carriage moving on rollers along a small railway. The scraper or bar, instead of being pressed down by a lever, is acted on by a spring, which keeps it in strong contact with the tympan. A cylinder worked by a handle sets the carriage in motion, and the stone is thus brought under the action of the scraper or pressing-bar.

Some remarkable specimens of printing of natural objects have of late years attracted attention by their variety and beauty, and

show how countless are the ramifications of the printer's art. By means of the galvanoplastic process, fossil fishes have been reproduced upon paper with the exactness of nature. For this purpose a mould of the fish is taken in gutta-percha, which by the action of a voltaic-battery is coated with copper, thus forming a plate on which all the markings of the fish are reproduced in relief, and which, when printed at the typographical press, give a result on paper identical with the object itself.

Impressions resembling aquatint engravings have been obtained without the assistance of the engraver by the following process:—a plate of silvered copper is covered with a landscape or other subject by a good artist, who uses various coats of a paint composed of an oxide, such as that of iron, burnt sienna, or black-lead ground up with linseed-oil. The substance of these coats is thin or thick according to the tenacity of the lights and shades in the picture. The plate is then submitted to the action of a voltaic-battery, by which means another plate is obtained, reproducing an intaglio copy, with all the unevenness of the original painting, and which can, of course, be printed from like an actual engraving.

In the process of *galvanoglyphy* a drawing is etched upon a plate of zinc coated with varnish, and upon this a coat of ink is spread by means of a small composition roller. The ink is deposited only on those parts where the varnish has not been removed by the etching-needle, the sunken portion of the engraving being left free. When the first layer is dry a second is applied, then a third, and so on until the original hollows are thought to be deep enough. The plate is then placed in the voltaic-battery, and another plate is thus produced on which all the hollows of the engraving are in relief.

In the process of *chemotypy* casts in relief are obtained from the engraving. A polished zinc plate is covered with an etching-ground, the design is etched with a point, and bitten-in with aquafortis; the etching-ground is then removed, and the acid well cleaned off. Filings of fusible metal are next placed on the plate, which is heated until the fusible metal fills up the engraving; when cold the surface of the fusible metal is scraped down to the level of the plate, leaving only that portion of it which entered the hollow parts of the engraving. The plate of zinc is next submitted to the action of a weak solution of muriatic acid; the zinc alone is attacked, and the fusible metal which was in the hollow of the engraving is now left in relief, and may be printed from.

Lithographic drawings, or, indeed, drawings of any kind, can be reproduced by Mr. Gillot's method, which goes by the unwieldy name of *paniconography*. A plate of zinc is well polished with pumice-stone, and on this the writing or drawing is executed with lithographic crayon or ink, or the impressions printed from copper or steel-plates, wood-engravings or type, may be transferred to the zinc-plate by wetting the impressions with dilute nitric acid, placing them on the plate, and passing them through a roller-press; a process adopted in what is called *anastatic printing*. The surface is then inked over with a roller, so as to increase the thickness of the ink, which is afterwards consolidated by dusting finely-powdered resin over the plate; the resin adheres to the ink only, and can be easily removed from the other parts. To obtain a block in relief the plate is put into a shallow trough containing very dilute sulphuric or muriatic acid. A rocking motion is given to the trough, by which the acid is made to pass slowly to and fro over the plate, and in the course of half an hour the etching is completed, and a relief-block is obtained, from which the large whites are removed by saw-piercing. Should the plate contain writing, or many fine lines, it must be taken out of the acid from time to time, and the surface be again inked with lithographic ink, and powdered with resin to protect the edges from the undermining action of the acid. Transfers from old impressions of wood-engravings may be made by sponging them on the back with dilute acid, and then operating as is usual with lithographic transfers.

The photographic portraits which are exhibited in such profusion in the Stationery Court are exquisite examples of printing by the delicate fingers of the solar light. The earliest successful experiment in photographic printing was made in 1839, by Mr. Fox Talbot, whose method consisted in soaking writing-paper in a solution of common salt, and when dry washing it over on one side with a solution of nitrate of silver. This was done by candle-light, and the paper was dried at the fire. A film of chloride of silver mixed with an excess of nitrate of silver was thus formed on the

surface of the paper. In using this sensitive surface to obtain a copy of an engraving or the leaf of a tree, the engraving or the leaf was placed upon it, and pressed firmly together between two plates of glass (or in the apparatus represented in Figs. 284, 285, and 286, which represent two front views, and the method of fixing

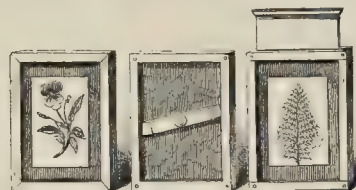


Fig. 284.

Fig. 285.

Fig. 286.

at the back), and thus exposed to the light for half an hour or an hour. A *negative* impression was thus obtained, or one in which the shadows were represented by lights, and the lights by shadows; the portions which had been exposed to the strongest light becoming dark, and where less light was transmitted, the blackening was less, while the parts which transmitted no light at all were left white. The impression was fixed by placing it in a strong solution of common salt. Although great improvements have been introduced since this method was published, the art of photographic printing remains in principle the same. In multiplying a photographic portrait a sensitive coating is applied to the surface of a pane or glass, on which is thrown the optical image of the sitter as formed in the camera-obscura; by treating the plate with a developing liquid a negative is formed, and a sheet of sensitive paper is placed under it, which by exposure to the light receives a *positive* impression; this being fixed the process is complete, and in this way any number of impressions can be taken from the same glass plate.

Photography has revealed much of the marvellous power of light in reducing certain chemical substances, and forming new combinations among them; but it does not inform us of those mysterious effects which are going on constantly around us, or of the nature of that vivifying influence which light so cheerfully impresses on the whole of creation. Some years ago M. Moser discovered the fact that light constantly emanates from all bodies, even in complete darkness; and that when two bodies are placed near each other, the one impresses upon the other a picture of itself. In this way true photographic pictures are formed, engravings copied; the glass which serves to protect a framed engraving from the dust has readjusted its molecules to the lights and shades of the picture: but in all these cases the impressions are invisible, and they remain so until developed by exposure to the vapour of water, of mercury, or of iodine. The vapour arranges itself in the most delicate manner on the glass, and clearly indicates that the molecular change which it has undergone has been regulated by the print, or rather by the light reflected from the print back to the glass. The experiment may be tried by placing a coin, such as a sovereign, on a piece of glass, and leaving it on a warm mantle-shelf for half an hour, when, by exposing the glass to the vapour of mercury, an image may be obtained of that side of the coin which was in contact with the glass.

A remarkable process of photographic engraving has been contrived, based on the fact observed so long ago as 1827, by M. Niepce, that the bitumen of Judea becomes insoluble in oil of lavender by exposure to the sun, while those parts which have remained in the shade retain their solubility. Powdered asphalt with a little bees'-wax is dissolved in oil of lavender, and mixed with an equal bulk of benzole. The surface of a steel plate is then well cleaned with whitening and water, after which a solution of muriatic acid is poured over it, and the plate is immediately washed and dried. The solution of bitumen is poured upon the plate in a darkened room, and dried at a gentle heat. A positive photographic proof is then applied to the surface, covered with glass, and exposed for a short time to the action of diffused light. The plate is next subjected to the action of a mixture of naphtha and benzole, which acts upon the parts which have not been exposed to the light. The solution having been washed off with water, the exposed parts of the plates are bitten-in with a mixture of nitric acid, alcohol, and water, after which the plate may be submitted to the ordinary processes employed in aquatint engravings.

A modification of this process has been applied to lithography, for which purpose the bitumen, dissolved in ether, is poured upon the stone, and a negative photograph being placed upon it, it is exposed to the light. The stone is now washed with ether, which dissolves the unexposed parts of the film, and does not act on those which have been modified by the light. The surface is then acted on with dilute acid, and washed, when it may be used with lithographic ink, which attaches itself to the parts upon which the bitumen is left. The results obtained in this way are said to be very good.

The coloured impressions of ferns which strike the visitor of the Stationery Court by the life-like resemblance to the originals, are made to print themselves in the following manner:—the specimen to be copied is placed on a sheet of lead, and passed through a roller-press, by which means every part of the plant (even the most delicate markings of the leaves) leaves an impression. By submitting this plate to the action of the voltaic-battery a copy in copper is obtained in relief, and can be printed from. By applying properly coloured inks to the various parts a copy is obtained in all the natural colours at one printing.

The reader will judge from the foregoing details, how universal is the process of printing. We have nearly reached our limits in this notice, but we cannot quit the Stationery Court without giving a few details on the bookbinder's art, which should ever be held in honour.

A book being printed in sheets in the manner already described, the first step towards the binding is called *gathering* or collecting the sheets into quires in their proper order. In this process the gatherer is guided by the *signatures* of the sheets, which usually consist of the letters of the Roman alphabet, the first sheet being marked B (A being reserved for the title, contents, &c., which are usually printed last), the second sheet is marked c, and so on. In this alphabet the letters J, V, and W are omitted, so that the twenty-third sheet is marked AA or 2 A, the twenty-fourth BB or 2 B, and so on; while the third alphabet begins with AAA or 3 A, and so on. It is also usual, for the purpose of guiding the printer in imposing, and the folder in folding, to insert other minor signatures at the bottom of the third page of every sheet, such as B 2, c 2, &c. In gathering the sheets, the last sheet is taken first; and proceeding from z (if that be the last) backwards to B, the sheets are thus arranged in their proper order for folding. The title, contents, &c., or signature A, is then placed with the other signatures, and the whole being folded into quires, the gatherer proceeds as before until the whole impression has been made up into quires.

The sheets are folded with great rapidity by females with the assistance of a paper-knife, Fig. 287; the sheets are then sub-



Fig. 287.—FOLDING.

jected to pressure in a hydrostatic press, or if the sheets have been printed some time, and the ink be properly set, they may be passed between rollers, Fig. 288, the effect of which is very superior to the old method of beating with a hammer.

The sheets are next collated, to see that the signatures run properly, and the plates (if any) are inserted in their proper places. The waste leaves are added at the beginning and end; the back

and head are knocked up square, and the book is placed between pressing boards with the back of the sheets projecting, in which

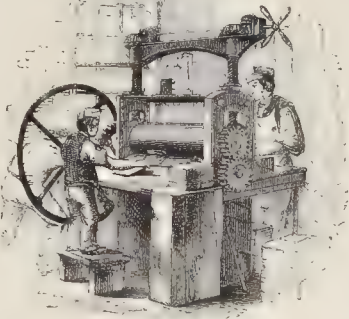


Fig. 288.—ROLLING.

position the book is placed in the *cutting-press*, Fig. 289, consist-

ing of two wooden cheeks *c c* connected by two slide bars *b b*, and two wooden screws *s s*, which are worked by an iron bar. A tenon saw is passed across the back of the sheets, so as to make a number of grooves for the reception of the cords or bands for holding the threads in the sewing,

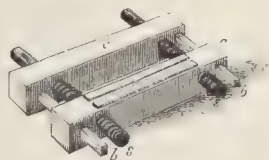


Fig. 289.

and also for securing the boards which form the side covers. The book is then taken to the *sewing-press*, Fig. 290, which is a stout

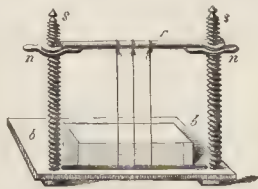


Fig. 290.



Fig. 291.

flat board containing an upright screw *s* at each end, supporting a top rail *r*, which rises and falls on the screws by means of nuts *n n*.



Fig. 292.

Attached to this rail are several cords corresponding with the grooves sawn in the back, which cords are secured by being fastened to brass keys, one of which is shown in Fig. 291, passed

through an aperture in the bed of the press, and tightened by turning the nuts *n n*. There are various kinds of sewing, depending on the size of the book and the style of binding; and for the better kinds of binding, instead of sawing grooves for the bands, tapes are used in place of strings, as shown in Fig. 292.

The books having been sewed, a layer of glue is brushed over the back, and on this is placed a shred of paper or coarse thin canvas of the size of the back. If the book is to be boarded or bound in cloth, the canvas is made to project a little on each side, for the purpose of securing the side boards. The book is next placed in the cutting-press, and the edges trimmed with a knife, without, however, cutting through the folds of the sheets. The back of the book is now rounded by tapping it with a broad-faced hammer, after which each book is placed between a couple of wooden boards, with the back projecting, and is put in a screw-press. The man then, by a succession of blows, causes each side of the back to project a little over the boards, so as to form grooves for the reception of the side covers. The books are now placed in their cases, and the outside fly-leaf being pasted to the boards, the books are built up between wooden boards, with the backs projecting, and are placed in a *standing-press*, Fig. 293, where they are left for some hours. The

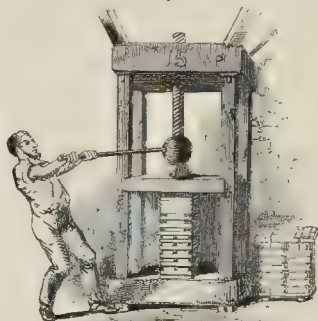


Fig. 293.

mill-boards, which form the solid substance of the cases, are supplied to the binder in large sheets, and he cuts them up to the proper size by means of a knife, as shown in Fig. 294. The cover of the book may be of leather or of cloth, and in either case it is ornamented at the back and sides with a pattern which is



Fig. 294.

produced in various ways. Embossing is now much practised, for which purpose the *embossing-press*, Fig. 295, is used. This consists of a solid iron frame, well secured; the lower bed of the press (also of iron) is perforated with two openings, for the reception of a row of gas jets for the purpose of heating it; on this lower bed is placed the metal die containing the pattern, while the counter die is formed by pasting pieces of mill-board to the surface of the upper bed. By swinging round the arms of the press, which are

furnished with huge balls at the extremities, the mill-board is brought down with amazing force on the metal die, and takes an impression therefrom. When the counter die is properly adjusted,

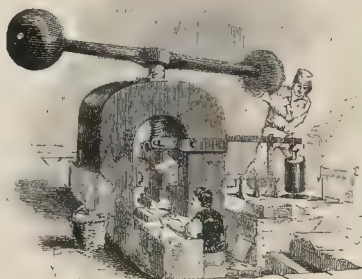


Fig. 295.

the leathern covers are passed one by one through the press, and the ornaments are embossed on them with great ease and rapidity.

Cloth covers are embossed after the boards are inserted. The ornaments may be produced by pressure only, which is called *blind-blocking*, and when done by hand, *blind-tooling*, while the gilt ornaments or lettering are called *gold-blocking* or *gold-tooling*. The *blocking-presses* do not greatly differ, except in power, from the fly-press already described. The pattern is cut out in a thick plate or block of brass fixed in the upper bed of the press, which contains a cavity for a row of gas-jets. The cloth covers are inserted within metal rules, which serve as a gauge, by a man who sits before the



Fig. 296.

press, while another man swings round a long lever, whereby the upper bed is brought down upon the case in the lower bed, and embosses the impression. When the cases are completed in this way, they are taken to the gilder, who covers the parts intended to be gilt with a little white of egg, and then with a film of leaf gold. The covers are then passed to a gold-blocking press, Fig. 296, containing a plate or block with the lettering and other ornaments intended to be gilt, and heated by jets of gas. The cover being introduced into a gauged bed, the man by means of a lever brings down the heated plate upon the cover, and permanently fixes the lettering and device. The superfluous gold is wiped off with a piece of rag, and the covers are now ready for the books which we left in the standing-press. The covers are secured by glueing to the boards the canvas strips which project on each side of the back, and to conceal the arrangement as well as the uncovered parts of the boards, and to give a neat finish to the book, some coloured paper, called *lining-paper*, is glued in. The books are then put into the standing-press for a few hours, and are then ready for delivery

Most of the literature of the present day is cloth-boarded in the manner above described, and as the amount of work is vast, it is performed on that wholesale system which has been gaining ground of late years in this country, absorbing the small independent tradesmen, just as the large and increasing estate has absorbed the small farm of the yeoman, and well-nigh extinguished yeomen as a class. We have been accustomed to regard cotton, silk, flax, and wool, as proper subjects for the manufacturing system, and are not surprised to learn that a manufactory employs hundreds, and even thousands of hands, male and female. The steam-engine, the spinning-jenny, and the power-loom have rendered the existence of the picturesque Jersey-wheel and the domestic hand-loom impossible; but we are scarcely prepared for a wholesale furnishing manufactory, or *house-decorator*, as this colossus of trade is now called, who will undertake to decorate the whole interior of a house, to supply the whole of its furniture, and present it fit for habitation. Still less are we prepared for a book manufactory, or an establishment where the printing, decorating, binding, and finishing of a book are carried on; where steam-presses and copper-plate presses are displaying their marvellous results of production, and wood engravers and copper-plate engravers are busily plying their skilled labour. Such things are doubtless necessary consequences of the progress of a great nation in population, in commerce, in improved means of intercommunication, in education, and a keener appreciation of the comforts of life. The result of printing by steam has been to increase books many thousand fold; and as this and other causes have proportionally increased the number of readers, it was necessary to readjust the modes of production, even of such intellectual things as books. So strongly does one of the great book-binding establishments to which we have referred resemble a manufactory in the vastness and rapidity of its results, that we have known the whole impression of an octavo work, consisting of 1000 copies, to be bound in the course of six hours, in which case, however, the cloth covers are prepared a day or two before, the number of sheets being stated, and the title, style of ornament, colour of the cloth, &c., being also determined. A thousand covers, or cases, can be prepared in one or two days, but the book itself can be folded, stitched, glued, and rounded, the edges trimmed, and the book mounted in cases and pressed, all within six hours.

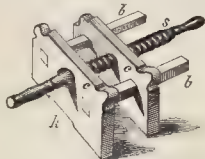


Fig. 298.

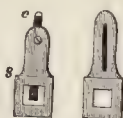


Fig. 299.

For leather bindings, such as those for Bibles and prayer-books, the edges, instead of being trimmed with a knife, are cut through

with a *plough*, Fig. 298, which consists of two cheeks of wood *cc*, connected by a wooden screw *s*, and a couple of guides *bb*. By turning the screw the cheeks are brought closer together, and, in the contrary direction, they are moved farther apart. Into one of the cheeks *k* is fixed a cutting knife, Fig. 299, a double-edged pointed blade, of which two forms are shown. The book to be ploughed is placed between a couple of boards in the cutting-press, Fig. 289, with the edges projecting, and one of the cheeks being placed in the groove of the press, the point of the knife is brought up to the book, and is moved backwards and forwards against it, the knife being advanced by turning the handle *s*. In common binding the white edges are sprinkled with a mixture of coloured chalk, umber, Venetian red, or ochre, in size and water, for which purpose a brush dipped in the mixture is held a few feet from the books, and by striking it a shower of drops falls down upon the edges, and produces the

intended effect. The colour is fixed by passing an agate burnisher over the edges. For the better class of binding the edges are *marbled* by the process by which marbled paper is produced. The colours employed are the ochres, and such animal and vegetable matters as will float upon a solution of gum-tragacanth. The colours are mixed with various combinations of beef-marrow, several different oils, such as nut, rape, &c., turpentine, white-soap, potash, a soap of wax called by the French *colle à lissier*, alum-water, and tartaric acid. The workman has his colours properly mixed in pots, or stone jars, with a brush in each. Taking up a brushful of colour, he strikes it on his left hand, so as to jerk a shower of drops upon the bath of mucilage, when each drop slowly spreads. He then takes a brush containing another colour, and throws down a shower of drops as before; he may use a third or fourth brush with different colours. By a little contrivance he strikes the brush so as to make some colours fall in large and some in small drops, and he finishes by showering down in the greatest size and abundance the colour that is to predominate, or form the ground. The colours partially blend, and form those pebble-like patterns which are so well known; and the spreading of the ground drives the other colours into

narrow streaks, like the cement between the pebbles of a conglomerate marble, whence the French call papers of this variety *papiers cailloutages*. The paper to be marbled is now laid upon the bath, and on taking it up carefully the whole of the pattern will be found adhering to its surface, and this, when dry, may be fixed by polishing with an agate. By dipping the ploughed edges of a book into the bath prepared with the required pattern, the colours attach themselves in like manner, and may be fixed by means of the agate burnisher.* The *curled* marble pattern is formed by introducing the

* In Mr. De la Rue's *tridescant* marbling the colours depend on the vibratory or undulatory nature of light; in most cases, on the interference, or mutual stifling of some of its vibrations or waves, when reflected at different surfaces, so near as to have only the interval of a few of these minute waves. A sheet of paper glazed with flake-white is placed on a sloping plate of perforated zinc, and water is poured over it; it is then lifted by the zinc, and placed beneath the surface of water, on which is poured a few drops of varnish, necessary to form the film. The solvent of the varnish, being an essential oil, or chloroform, dries quickly. The zinc plate, with the paper on it, is then

point of the handle of a brush among the colours, and giving it a few spiral turns; *combed* patterns are produced by first moving the point of a stick through the bath repeatedly from end to end, so as to draw out the colours into streaks, and then passing the teeth of a brass comb across them at right angles, which notches them into the serried ranks of narrow repeated arches, as seen on the edges of account-books.

In the better class of binding, as in whole bound calf, lettered, with raised backs, the boards are added after the glueing and rounding of the backs; for which purpose the sewer leaves small projecting pieces of string bands, which are passed through holes made in the boards, and are secured with glue. After ploughing the edges they are marbled, or gilt, the latter operation being performed with gold-leaf laid on with glaire, or white of egg, and polished with agate. The *head-band*, which serves as a finish to the top and bottom of the sheets, consists of a small strip of mill-board, secured by needle and thread, and the thread is twisted or plaited over the strip, for which purpose the book is held in a small screw-press, as shown in Fig. 300. The head-band, instead of being *worked*, may be *stuck on*. The leather cover, being cut to shape and pared at the edges, is damped, covered with paste, and applied to the book,—a few simple tools being used to smooth it down and press it into shape, to square the edges, and to raise the bands. When this is properly arranged the marbled, or other lining-papers are inserted, and the book is put into the standing-press. The ornaments are put on by means of brass tools, Figs. 302, 303, 304, heated at a gas-stove, Fig. 305; and the ornaments may belong to what is called *blind-tooling*, or *gilt-tooling*. For the latter gold-leaf is put on by means of glaire, and the heated tools being pressed down, permanently fix the gold to the leather, the superfluous gold being wiped off with a rag. The lettering is done by a set of letters cut in brass, and selected according to the subject, each letter being used separately. Certain titles in common use, such

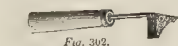


Fig. 302.



Fig. 303.



Fig. 304.

as "Holy Bible," "Atlas," &c., are usually cut on one tool, as in lifted out and left to dry, with the excessively thin film permanently attached. This may afterwards be printed with black patterns, which heighten the iridescent effects.

Fig. 306. When the ornaments, lettering, &c., are complete, the book is finished off with polishing irons of various shapes and sizes, one of which is shown in Fig. 307. Vellum binding is a distinct branch of the trade, and is chiefly used for account-books.

We have thus gone over in a rapid manner the chief details of the binder's art, and must conclude with one or two examples of those elaborate bindings which were referred to at the commencement of this notice. Fig. 297 is a carved book-cover by Madame Gruel, of Paris. Good taste in an inappropriate position is almost as objectionable as bad taste in a position where ornament is a natural and necessary part of the subject, and therefore appropriate. The house to which we owe this example is celebrated for its book-covers, carved in box or ivory, often of the most minute and elaborate design, and fitted rather to be framed and glazed, and hung up against the wall as artistic reliefs, than to undergo the rough wear to which we should suppose a book is likely to be exposed. Some persons adopt the practice of covering all their books with paper, so that they have even not the advantage of drawing-room furniture, from which the covers are sometimes removed,—and as these bindings are never seen, it would seem scarcely to matter whether they were plain or ornamental. Such bindings as Madame Gruel's do not even admit of being covered, and cannot be placed with their fellows on a book-shelf, but must be exposed to all the accidents of table-furniture; or if taken so much care of by the owner as not to be used at all, they become degraded to the level of a bright-poker ornament, which is a sad position for an intellectual production. Fig. 301 is a book-cover by Mr. Leighton, from a drawing by his son, designed for an edition of "Thomson's Seasons." The four seasons of the year are stamped upon it round a circle, on which appear the twelve signs of the zodiac; in the centre is a floral group comprising the crocus of spring, the rose of summer, the ripe corn of autumn, and the holly of Christmas. There is considerable merit in the design—it is free from the objections of embossed,

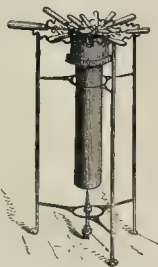


Fig. 305.



Fig. 301.—BOOK-COVER BY MR. LEIGHTON.

or carved surfaces; but it is liable to the serious objection of want of fitness. It is sufficiently elaborate to serve as a frontispiece to the work which it is intended to cover. Such a design, executed



Fig. 306.



Fig. 307.

on a leather surface in blind or gilt tooling, is an example of the now so common fault of attempting to make an art of small pretensions rival an art whose scope is illimitable.

The design by Mr. J. W. Evans, Fig. 308, is taken from an original specimen of the time of Henry II. of France; it is a small quarto, richly illuminated in gold and various colours, on brown leather; the black field is a positive dye, but the remaining colours



Fig. 308.—DESIGN FOR A BOOK-COVER OF THE TIME OF HENRY II. OF FRANCE.

are enamelled. We cannot help thinking that this design is in the true spirit of the book-binder's art, and we should be glad to see taste following this direction rather than adopting the absurd rivalry of the engraver, the painter, and the modeller. Fig. 309

is a tolerably good design for an album cover, but we think it might be improved by a less frequent repetition of the circle, which

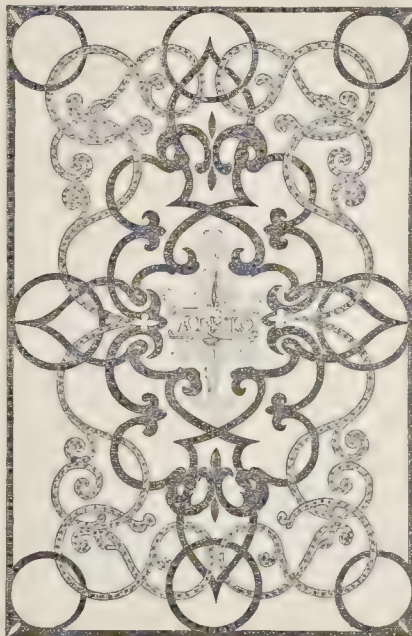


Fig. 309.—ALBUM COVER BY MR. BUDDEN, OF CAMBRIDGE.

is too geometrical a figure for pure ornament, and is the least graceful among the endless variety of curves.

THE INDIA-RUBBER COURT.

How easily do we adopt new objects and appliances, and assimilate the new ideas to which they give rise. Things which are regarded with amazement by one generation are looked upon as commonplace by the next. The father who has witnessed the birth of the electric telegraph, and can scarcely realise its wondrous results, sees his son send messages by it quite as a matter of course, and hears him speak of it with all the familiarity which a person feels when he grows up as it were to an invention, instead of the invention dawning upon his manhood. The name of Dr. Priestley is known to most of us as that of an original thinker, whose scientific discoveries, which resulted from the amusements of his leisure, have made his name immortal, while the theological discussions which formed the business of his life, and are included in a long list of publications, are forgotten. In one of the works of this celebrated man occurs the first notice of India-rubber. In the preface to his work on perspective, printed in 1770, he says:—"Since this work was printed off I have seen a substance excellently adapted to the purpose of wiping from paper the marks of a black-lead pencil. It must therefore be of singular use to those who practise drawing. It is sold by Mr. Nairn, mathematical instrument maker, opposite the Royal Exchange. He sells a cubical piece of about half an inch for three shillings, and he says it will last for several years."

Turning from this statement to the India-rubber Court of the Crystal Palace, we shall be indeed struck with the progress which India-rubber has made. For many years, however, after Dr. Priestley wrote, the use of India rubber was restricted to the purpose which he indicates. It is now scarcely possible to say what is the limit to its use: almost every domestic utensil, articles of furniture, and articles of dress, are made of this protean substance.

The India-rubber Court is situate in the north-east gallery: the

proprietor is Mr. Charles Goodyear, of New York, and the architect is Mr. Stannard Warne, who, adopting the principle of making the case illustrate the nature of its contents, constructed the stall entirely of India-rubber, so that the cabinet-maker has thus a new material placed at his disposal, and he may in this Court study the effect of India-rubber in the manufacture of sofas, chairs, tables, bedsteads, drawers, work-tables, pillars, and bas-reliefs. Among the innumerable articles of a miscellaneous kind, we have fruit-plates, card-trays, boxes, boxes inlaid with pearl (which, however, we think had better have been omitted), watch-cases, bracelets, brooches, and rings set with jewels (this also we hold to be a mistake); fruit-knives, and paper-knives, ladies' work-boxes, fans, opera-glasses, jewel-boxes, toilet-boxes, picture-frames, eye-glasses, ink-stands, paper-folders, powder-flasks, cork-screws, pen-holders, pencil-cases of peculiar construction, drinking-cups, buttons, syringes, surgical instruments of various kinds, canes and walking-sticks, umbrellas, combs, and brushes. We are not prepared to say that in all these cases the material is appropriate. The manufacturer seems desirous to astonish by the great variety of uses to which India-rubber can be applied, and he speaks as if he had done something worthy of applause when he assures you that the house and its contents are all of India-rubber. It would be almost as wise to make a tea-kettle of that substance as some of the articles above enumerated. India-rubber has properties peculiar to itself, which render it more fit for certain objects than any other substance, and these properties admit of a wide range of application; but we should as soon think of introducing a chimney-sweep to the society of the drawing-room as of placing an India-rubber bracelet on a fair lady's arm.

Caoutchouc is the produce, not of one tree or of one family of trees, but of a great variety of trees in different parts of the world,

but chiefly in the tropics. The milky juice contained in some of our own well-known plants, such as dandelion, celandine, and the spurges, closely resembles that which in hot countries forms caoutchouc; but especially is this the case with the common fig-tree (*Ficus carica*). Another species of fig (*Ficus elastica*) yields the principal supply of caoutchouc received from Continental India, and the supply from Java is also obtained from different species of fig. In Central America the best kinds of India-rubber are furnished by a plant called *Siphonia elastica*, belonging to the order *Euphorbiacea*; but the India-rubber of the Indian islands is obtained from a totally different plant—a climber of very rapid growth, and great size, *Urceola elastica*, a single tree of which is said to yield annually from fifty to sixty pounds of the milky juice.

From numerous sources, therefore, the substance is to be obtained, the quality varying with the species of plant, and with the greater or less degree of care bestowed on its collection by the natives.

The juice is generally collected at the foot of a tree which has been cut to let it escape, or it is run into a rough kind of mould or trench made in the ground, where it hardens by exposure to the

the purified portions of the caoutchouc are made to unite. The mastication is performed a second time dry, and the heat evolved by the process, together with the compression, causes it to form into a mass which is afterwards cut up into rectangular blocks. These are now placed in moulds, and subjected to powerful compression, the effect of which is to get rid of cavities, air-bubbles, &c. The blocks are divided into slices of various thicknesses by the action of knives moving with great rapidity, and kept cool by the play of a jet of water. Some of these



Fig. 310.

sheets are further subdivided into small parallel strips, which are used for rubbing out pencil-marks. The thinner sheets are used in the laboratory for making short elastic tubes for connecting pieces of apparatus together, the facility with which two recently cut and perfectly clean surfaces of caoutchouc weld together, admirably fitting it for the purpose. For example, the ends of two tubes may be connected air-tight by wrapping a piece of sheet

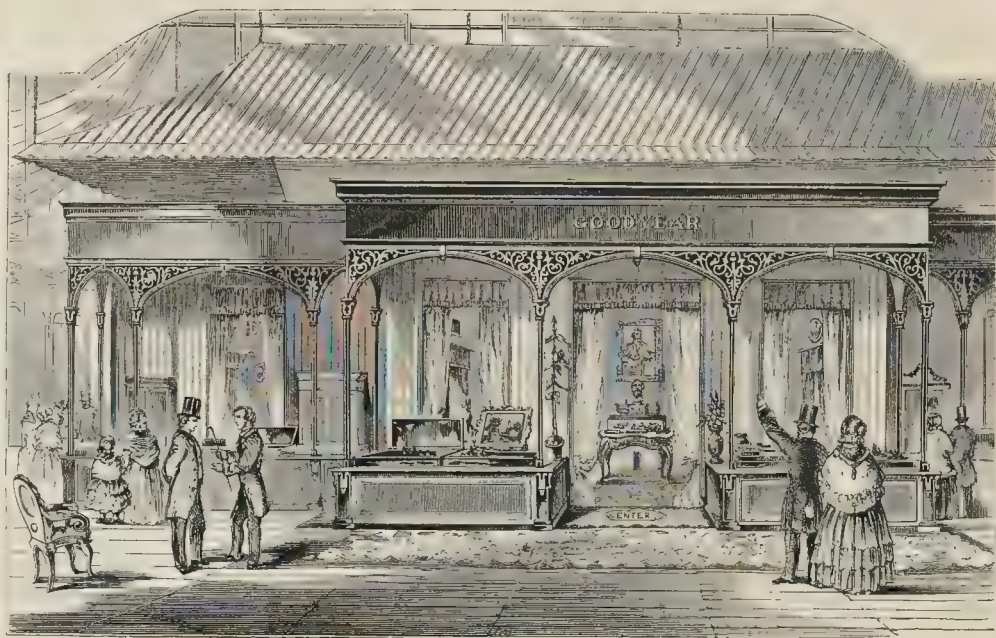


Fig. 311.—THE INDIA-RUBBER COURT.

air into large masses like the trunk of a tree. These are the rougher modes of preparation, and such India-rubber is often largely mixed with sand and other impurities. Wet weather is the most favourable time for collecting it, for the juice then flows most freely. Another form of caoutchouc is indicative of the rude art of the natives: it is modelled on plastic clay into the shape of bottles, pear-shaped bodies, figures of animals, slippers, &c. This seems to be done by dipping the mould into the partially thickened juice, and allowing it to harden, then dipping again, and so on in successive layers. When this is well done, the India-rubber so obtained, is fit for many uses without further preparation. But when the different layers are badly united, it is necessary to work up the whole afresh by kneading, and it often happens that the substance is so impure as to be unfit for use without a further process.

Caoutchouc is purified by being submitted to the action of cylinders furnished with teeth, which move at unequal rates of speed in opposite directions. During this kind of mastication a jet of water is made to play upon the apparatus, by which means the impurities crushed by the mill are gradually carried off, and

caoutchouc over the ends, as in Fig. 310, and cutting off the superfluous portion with a pair of scissors, when on pressing the fresh-cut edges together they cohere so as to form a perfect tube.

The most important application of caoutchouc was made by Mr. Mackintosh about the year 1820, namely, to the purposes of waterproofing; while to the French we owe the art of drawing it out into delicate threads for the preparation of elastic tissues. The garments called *Mackintoshes* are made of fabrics covered on one side with caoutchouc, or two fabrics are united with caoutchouc between them, they thus become impermeable to water, while most of the flexibility which belongs to a garment is retained. For the purpose of applying the India-rubber to a fabric it is first kneaded with spirit of turpentine or naphtha, and thus reduced to a pulpy consistence, in which state it is spread over the cloth by means of a flattening-mill.

The threads of caoutchouc used for making elastic tissues are prepared in the following manner, which, however, is varied by different manufacturers. A hollow cylinder of caoutchouc is formed by placing within a mould *m* a solid core, and using a hollow piston or plunger *p*, as in Fig. 312. This cylinder is made into

tapes by cutting it from end to end in a spiral direction, or the thin sheet already referred to may be cut up into tapes. These



Fig. 312.

tapes may be cut up into threads by the machine, Fig. 313, in which a series of circular knives *l* are fixed on an axis *m*, between two circular plates, one of which is capable of movement, and of being tightly fixed on the axis when the knives are in their places; there being a washer or disc of metal between every two knives for regulating the distance apart, according to the thickness of the thread required. The circular knives are three inches in diameter, and are made to revolve with considerable velocity: *n* is another axis, bearing a cylindrical block of hard wood (such as wainscot oak), against which the cutting edges of the knives

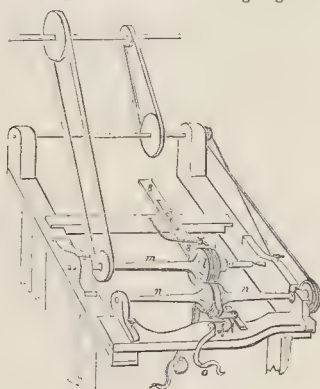


Fig. 313.

come, and slightly cut into the block, which should be made of several parts or sections, in order that the grain may run from the centre outwards in all directions. The axis *n* revolves but slowly in comparison with the cutters, as will be seen by the dimensions of the driving pulleys to each—the axis *m* making about 1400 revolutions per minute, and the axis *n* only 24: *o* is a tape or sheet of caoutchouc being cut; it is guided between the pins *p*, and between the spring guide plates *q*, there being a constant stream of water supplied to and amongst the knives by the pipe *r*: *s* is a piece of wood, in the cuts of which the knives work, and are thus cleaned, any portions of caoutchouc which might otherwise remain between the knives are removed.

By a slight increase of temperature the threads thus formed can be greatly increased in length by drawing them out and rolling them upon bobbins. By exposing the bobbins to a low temperature the threads lose their natural elasticity, and can be used like common threads in the fabrication of stuffs by weaving; they can also be covered with threads of cotton, silk, &c., and compound thread be introduced into new tissues. The perfect manner in which recently-cut surfaces of caoutchouc unite, allows of threads of any length being formed. When the fabric is finished, the application of a hot iron causes the threads of caoutchouc to shrink back to their original length, and to regain their elasticity.

Caoutchouc is liable to the inconvenience of becoming hard and brittle by exposure to cold. It has been discovered that by combining caoutchouc with a minute portion of sulphur this property may be got rid of. Indeed this combination, called *vulcanised India-rubber*, may be regarded in many respects as a new substance. The invention of this substance we owe to America, and the great improvements which have been made in the manufacture are in great measure due to Mr. Goodyear, the proprietor of the India-rubber Court in the Crystal Palace. Mr. Goodyear's first success was in the production of India-rubber shoes, which are as of much importance as the waterproof fabrics of England and the elastic tissues of France. Since the year 1842 these shoes have been imported into Europe, and they possess the valuable property of not becoming rigid by cold, nor do their surfaces adhere when pressed together. During a long period the means by which these desirable results were attained remained secret, since Mr. Goodyear

had not taken out any patent for his invention. Mr. Thomas Hancock, of Stoke-Newington, however, discovered that by dipping a band of caoutchouc into melted sulphur it did not lose any of its properties, but by a subsequent exposure thereof to a temperature of 300° it acquired new ones, which were in fact identical with those of the India-rubber used in making the American shoes.

In the vulcanisation of India-rubber the materials are masticated in the machines already referred to, the heat generated by the friction being sufficient to effect the combination. The India-rubber in this state becomes hard by exposure to cold, and has not acquired any new properties. By exposing it to a temperature of 300°, however, it becomes, as already remarked, a new substance. It is no longer soluble in substances which dissolve caoutchouc, but on being placed in them absorbs them, swells out, and on being removed gradually resumes its original condition. It does not become rigid by cold, its surfaces do not adhere by pressure, and it is not altered by exposure to a temperature which would make ordinary caoutchouc sticky. The absence of the property of adhesion between two surfaces of vulcanised India-rubber is so decided, that no use can be made of the shavings of that material produced during the manufacture; and the separation of the sulphur, so as to bring back the vulcanised to the common form of India-rubber, is a problem which still remains to be solved. In the manufacture, the compound of sulphur and India-rubber is forced into moulds of the shape of the articles required; heat is then applied, and this gives the permanent and peculiar qualities of the vulcanised India-rubber already referred to.

India-rubber may be "converted," as the vulcanisation is called in commerce, by sulphur in a state of combination, such as the chloride. If articles of common caoutchouc are immersed for a minute or two in chloride of sulphur largely diluted with sulphuret of carbon, and then exposed to the proper temperature, they acquire all the properties of vulcanised India-rubber.

In consequence of this useful discovery, mackintoshes are made much lighter and with less smell, and they have a permanent suppleness. The price is also diminished, so that the vulcanised India-rubber cloth can be used instead of common tarpaulings for covering waggons, carriages, &c. Cloth of this kind has been made into portable baths, which retain water perfectly, and can be rolled up when not in use. It is also a valuable material for the pistons of pumps; and conical valves of this substance have taken the place of leather and metal ones. The use of this substance to form the piston valves in steam-engines of the screw principle, has tended greatly to bring these new forms of motive power into use. Sheets of this substance, of various colours, are used for moulded ornaments in furniture, and also in bookbinding. Air cushions and air mattresses are manufactured in considerable numbers of this substance, the mattresses being well adapted to the use of travellers and invalids: boats made of it and inflated with air have the advantages of being very portable and incapable of sinking. Wheels of carriages have been surrounded with vulcanised India-rubber, the effect of which is to remove the disagreeable noise of a carriage on a London pavement; but we are not sure that this is an advantage, since the noise is one of the safeguards of the pedestrian. Rollers for inking printing type and lithographic stones have been made of it; and it is used in making the cushions of billiard-tables, and for superseding the use of sacking-cords in bedsteads. So great and so perfect is its elasticity that a band of it may be used with good effect as a door-spring; and it untwists itself with so much force that it can be used in the mechanism of window-blinds. "A thin tube of India-rubber, of tolerably large diameter, but flattened at the bottom, so that it terminates in two flat edges, which the elasticity keeps in juxtaposition, constitutes an apparatus of extreme simplicity, which perfectly supersedes ordinary hydraulic valves. The edges, which are in contact below, open by the pressure of any liquid passing through the tube, and close when the liquid has run out, thus preventing any fetid gas escaping from below. The elasticity of India-rubber has made a ring of it applicable for uniting cast-iron or earthen tubes used for the conveyance of water. This indestructible and movable tube, which admits of widening, and allows the pipes to slide one within another, presents a method of fitting which seems destined to render notable service in the conveyance of water in large towns. A thin, hollow sphere of India-rubber, terminating in an appendage in the form of a tube, introduced in a flaccid state into an opening accidentally made in gas or water-pipes, may, by

means of being expanded by inflation, be used to press upon the sides of these pipes, and thus present a method of occlusion of great simplicity, which will allow these pipes, which it has become necessary to replace, to be removed without inconvenience." *

Mr. Hodges makes use of cords of vulcanised India-rubber for the purpose of raising weights, a number of these cords attached to a fixed point being stretched down to the weight, when the sum of the elasticities will raise it. By stretching a number of cords in succession, and releasing them all at once, a projectile force has been obtained, which is said to be useful in throwing harpoons, &c.

Masses of vulcanised India-rubber have been used instead of the metallic springs in the buffers of locomotive carriages with great advantage, from the ease with which this substance deadens shocks. Ordinary cloths covered with India-rubber offer considerable resistance when pulled in the direction of the fibres, but they easily tear when pulled in an opposite direction. Mr. Goodyear has got over this inconvenience by producing a kind of felted-stuff, formed in successive layers, and in variable numbers of threads crossed in different directions, so as to be able to resist with equal effect a strain in any direction. By covering these stuffs, formed of from three to six coats of entangled threads, with a thin coat of India-rubber in a pulpy state, the interstices of the fibres are thus penetrated and their adhesion increased, by which means waterproof material has been obtained adapted for the covering of damp walls, and also for printing on, in making wall-maps. This fabric has also been used for covering a kind of woollen wadding, the material of a remarkable warm waterproof clothing. By covering this felted stuff with cotton fabrics, table-covers have been formed, and by applying to the same felt a thick woollen down, carpets have been formed, well adapted to resist cold and moisture. By covering the two sides of rough canvas with these felts, sail-cloths and tarpaulins of a superior description have been obtained.

Some of the articles exhibited in the India-rubber Court are prepared by the addition of magnesia to the caoutchouc and sulphur, by which means a kind of plastic wood is obtained capable of being moulded into any required form. Like India-rubber it also admits of being coloured, and by partially mixing the differently coloured masses, shaded specimens are produced, which are used instead of horn in the manufacture of buttons, knife-handles, &c., and when rolled out into thin sheets may be used as veneers for furniture.

There is another substance which of late years has attracted as much attention as India-rubber, viz., gutta-percha, which like India-rubber is a carburet of hydrogen, and possesses many of its peculiar properties; and it is as indestructible by means of chemical agents. Its consistence is midway between that of leather and wood, it admits of being softened by heat and of becoming hard on cooling: like wax it will receive and retain the most delicate impressions; in short, the uses to which it is now applied, if not so numerous, are in some respects as important as those of vulcanised India-rubber. Perhaps the most important use of this substance is for insulating the wires of the submarine-telegraph, which has in so wonderful a manner brought this country within speaking distance of the continent of Europe, and promises to bring that of America into the same amicable relationship. It may readily be supposed that a substance which admits of being softened by heat and moulded into various forms, and on cooling regains its leather-like properties, should have various uses, especially when we consider that with all the properties of leather it has peculiar properties far surpassing those of that substance. Like metal it can be melted up again and be made as good as new, and articles made of it, when damaged by wear, can be made new again by the application of heat and a little manipulation.

Gutta-percha is the concrete juice of a forest-tree, a native of the shores of the Straits of Malacca, Borneo, and the neighbouring countries. The natives had themselves discovered its valuable properties before they became known to Europeans. They constructed whips, buckets, and vessels of various kinds out of the hardened juice, and thus excited the attention of travellers to this substance. The native method of proceeding, however, has been of the most destructive kind, especially since the demand of the European markets for this substance has had to be met. Instead of economising their treasure, as is done in the case of the caoutchouc, by tapping the tree and allowing its juice to ooze out gradually from the incision, they fell the tree at once, and removing

strips of bark at intervals, collect, indeed, a large quantity of sap at one time, but destroy all future supplies from that source. This wholesale destruction of the gutta-percha trees, which are naturally slow of growth, must, if unchecked, necessarily involve the destruction of the traffic which is now so brisk and advantageous in this article. To put any check upon these proceedings is said, moreover, to be extremely difficult; because each set of explorers, in searching after these trees, is more anxious for present profit than for future benefit to the trade. A very small quantity, comparatively speaking, is to be obtained by tapping, and it is evidently to the interest of the first comers to get a full supply of sap for themselves, without considering those who come after, and who might very probably cut down the trees if they had been spared previously.

The first accounts which reached us of these trees were given by Dr. Montgomerie, of Bengal, who appears to have been the first person to notice the native use of this substance; this was in 1842. In 1843, Dr. D'Almeida presented a specimen of their inspissated juice to the Society of Arts, and described some of the advantages which would accrue from its use. This communication led to no results; but another, made shortly after by Dr. Montgomerie, was more successful, so that by the united efforts of these gentlemen gutta-percha was introduced to public notice, and soon told its own tale to our manufacturers. The gutta-percha tree is from sixty to seventy feet high, and three or four feet in diameter. Its foliage is of a pale green on the upper side, and is covered with reddish brown hair beneath. The wood is peculiarly soft, fibrous, and spongy, of a pale colour, and is traversed by longitudinal receptacles or reservoirs filled with the gum, forming ebony black lines. A branch of the *Isonandra gutta*, with various portions of the blossoms



Fig. 314.

are represented in Fig. 314; 1, being the flower scarcely expanded; 2, ditto, with the corolla expanded; 3, the pistil; 4, transverse section of the ovary; 5, vertical section of ditto; 6, the anther; 7, scarcely matured fruit, natural size; 8, transverse section of the same.

After the natives have cut down the full-grown trees, they make rings in the bark at the distance of every ten or twelve inches, placing under each as they make it a cocoa-nut shell, or the spathe of a palm, as a receptacle for the milky sap which begins to flow immediately that the incision is made. The sap is collected in bamboos, taken to their houses and boiled, in order to drive off the watery particles, and inspissate it to the proper consistence. Boiling appears necessary when the juice is collected in large quantity, but when a small quantity is allowed to exude from a freshly-wounded tree, and is collected and moulded by the hand, it consolidates perfectly in a few minutes, and has all the appearance of the prepared article.

The natives are not at all particular respecting the purity of the article, but will even introduce sand and stones into it for the purpose of increasing the weight. The commercial price, of course,

* Jury Report of the Great Exhibition, Class XXVIII.

soon adjusts itself to the frauds which lead to the necessity of purification in this country. The blocks of gutta-percha are cut into slices by a slicing-machine, then softened by means of hot water, divided and torn into shreds by the same machines as those which are used in the preparation of India-rubber, and by means of kneading under the action of jets of water, the stones and sand are separated. After this it is dried and kneaded into a homogeneous mass, when it can be drawn by the drawing-mill into cylindrical cords and tubes of various sizes, or it is spread out by means of a flattening-mill into sheets of various thicknesses; these are divided into bands, from which are cut out, by means of a knipping-tool, the pieces required in the manufacture.

The Gutta-Percha Company have introduced this substance in various forms, some of the most important of which are for marine use, since salt-water exerts no action upon it. Buoys of every description, for anchors, &c., have been made of it; sailors' hats, speaking-trumpets, &c. It appears to be well adapted for life-boat apparatus, and waterproof garments. The facility with which it combines with wood has been taken advantage of, as also with

leather in the formation of soles for boots and shoes. Ornaments in gutta-percha for interior decoration have been largely manufactured, and in spite of certain modern dicta, we see no reason why a beautiful form, whether of a frieze, a moulding, or a leaf, &c., should not, like an engraving, be multiplied to charm the eye and improve the taste of the many, instead of being confined to the few. The perfection with which gutta-percha resists the action of corrosive liquids has led to its use in lining casks for the conveyance of some of the strong mineral acids, instead of the large glass carboys. The use of gutta-percha for making stereotype moulds, and for some of the purposes of the galvano-plastic art were alluded to in our notice of the Stationery Court. The plastic nature of the material allows of sharply finished groups and objects being moulded, and these admit of being coated with metal, so as to perfectly resemble bronze, &c. We may also mention that gutta-percha has been combined with sulphur and the metallic sulphurets, the effect of which is to produce a substance as hard as ebony, which can be used for most of the purposes to which wood and ivory are applicable.

MACHINERY IN MOTION.

THE Crystal Palace Company, mindful of the attractions in the Great Exhibition of 1851 of those marvellous machines employed in the preparation of yarn and textile fabrics which appear to act with more than human intelligence, exhibit a series of machines for the preparation and spinning of cotton. They are contributed by Messrs. Walker and Hacking, of Bury, and consist chiefly of a *lap machine*, *first and second carders*, a *throstle frame*, and a *mule*. A notice of these machines will enable us to give a brief account of the cotton manufacture, the rapid development of which, at the end of the last and beginning of the present century, materially contributed to the national prosperity, and greatly assisted this country in maintaining her long and arduous struggle with despotism on the Continent. It may well excite our surprise that the downy covering of a seed, found in a distant part of the earth, should be productive of such prodigious results—that the wealth and continued prosperity of this country depend, to a great extent, on the continued abundant supply of this apparently insignificant article, the consumption of which in Great Britain within the last forty years has risen from 88,000,000 lbs. to 891,000,000 lbs. This immense quantity of raw material not only provides a portion of the clothing of our whole population, but furnishes one-third of the value of our entire exports to foreign countries, amounting, in the last year, to £32,284,700. Of the import of cotton for the last year, seven-ninths, or about 700,000,000 lbs., were furnished by the United States of America; and it is not without considerable anxiety that the failure of this source of supply—depending, as it does, on slave labour—is contemplated. It would be almost as unwise to depend upon a distant foreign land for our supply of corn, as for the supply of the raw material, the food of our industry, which enables our vast population to procure corn. Slave labour in the United States may fail, from a variety of causes which are now under frequent discussion; or the friendly relations which now happily subsist between our government and that of the United States may be interrupted. The cotton-growing resources of the United States, vast as they are, do not meet our increasing demand for the fibre; so that it behoves us to look to other sources of supply: and it does seem unpardonable, that with so many fine colonies of our own, many parts of which are admirably adapted to the growth of cotton, we should not, long ere this, have had abundant supplies from various sources. It is doubtless a work of difficulty to organise a new culture, and a new traffic, in countries where the habits of men are formed in an antique mould; where novelty is often synonymous with profanity; or, it may be, if the native population is acquainted with the raw material in question, the mode of preparing it by hand, or by antiquated machines, is not consistent with our enormous demands, and the people will not use our new and powerful machines—if, indeed, these are adapted to the nature and length of the fibre. Then, again, a colony well adapted for growing cotton may not be able to command labourers; or, if this difficulty be overcome, roads may be wanting to connect

the plantation with the seaport. These and other considerations show how difficult it is to organise new sources of supply of a material so greatly in demand as cotton. Should it be objected that tobacco, from a small centre of growth became quickly diffused over the earth, there is a special reason for the fact, which does not apply to cotton. To say nothing of tobacco growing in the temperate as well as the torrid zone, and hence having a much wider range than cotton, no sooner were men under the fascination of the fragrant weed, than they sought to possess themselves of it by direct cultivation, and thus secure what quickly became one of the prime necessities of life. In the case of cotton, however, the motive was not so strong, since many other substances were at hand for the purposes of clothing, and the great bulk of the population would rather put up with worn-out clothes than suffer the lack of their usual stimulant, or sensual indulgence.

The cotton plant (*Gossypium herbaceum*) is a member of the order *Malvaceae*, which contains our common mallow, to which it bears some resemblance. In some varieties the blossom is purplish, like that of the mallow, but in others it is of a pale yellow colour; the great difference is in the seed-vessel, the seed-coat producing a thick growth of vegetable hairs, or filaments, of considerable length, which fill the seed-pod, and when this bursts, there is a ball of snowy white or yellowish down, containing three locks, one for each cell, enclosing and firmly adhering to the seeds, which somewhat resemble grapes. The varieties of cotton-bearing *gossypium* are divided into *herbaceous*, *shrub*, and *tree* cotton, the first being the most valuable. The crop is annual, but shrub cotton, though annual in certain temperate climates, lasts in other parts for two or more years. The shrub is about the size of our currant bush. Tree cotton attains a height of from twelve to twenty feet. These plants are cultivated on a light sandy soil, near the sea, the saline breezes of which are favourable to its growth. The American sea-island cotton, which is cultivated on the low sandy islands from Charleston to Savannah, is celebrated for its long fibre and strong and silky texture. In Georgia, and the neighbour-



Fig. 315.—HERBACEOUS COTTON.

ing states, three varieties of herbaceous cotton are cultivated:—the first, from its yellow colour, is called *nankin* cotton; the second, *green-seed* cotton; and the third, *sea-island* cotton. The first two grow in the midland and upland districts, whence a fine white variety derives its name of *upland* cotton, or, from a former method of cleaning it, *bowed Georgia*. In the cultivation of cotton, the seed is sown by hand in March, April, and May, in rows five feet apart, while the seeds are eighteen inches apart, with several seeds in each hole. The land is well weeded, and when the plants appear, the weakest are pulled out; a few months later they are again thinned and *topped*, to the extent of one or two inches, in order to favour the development of side branches. When the cotton is ripe, it is gathered with the seeds, without the outer husk, which is brittle, and the pieces cannot easily be separated from the fibres. After the cotton has been dried, the seeds are separated from the wool, which is rapidly done by means of Whitney's *saw-gin*, and the cotton is then put into a long narrow hopper, one side of which is formed by a grating of strong parallel wires, $\frac{3}{4}$ th of an inch apart: close to the hopper is a roller, containing a number of circular saws $1\frac{1}{2}$ inch apart, which, in their revolution pass within the grating of the hopper, and seize by their teeth on the locks of cotton, dragging them through the wires, which are not wide enough to allow the seeds to pass also. The cotton is removed from the saws by a revolving cylindrical brush: one of these machines will clean 3 cwt. in a day. The fibre is somewhat injured by this machine, so that, in India and China, the better kinds of cotton are picked by hand, or a rude roller-gin is employed, after which the cotton is further cleaned by bowing, for which purpose a large bow being placed in a heap of cotton, the string is made to vibrate, and thus clean the heap. This process, however, is much too tardy to supply the wants of the cotton manufacturer.

Cotton is imported into this country in bags or bales (Fig. 316),



Fig. 316.

and the first process in the manufacture is sorting. As the contents of different bags may differ somewhat in quality, various qualities are equalised by forming a sort of stack, called a *bing* or *bunker* (Fig. 317), for which purpose the contents of one bag are spread out evenly on the floor: upon this the contents of a second bag are equally distributed; and so on until the height of several feet is attained. When the cotton is required for use, it is collected at the side of the bing by passing a rake from the top to the bottom, by which means a portion of every bag is taken. Much judgment and experience are required in bringing different samples of cotton thus together. They should have a similar length of staple, and should bear reference to their ultimate destination; soft, short, ribbon-like filaments are best adapted for wefts; and firm, long, and cylindrical ones for warps. The cotton in the bing is matted together, and contaminated with dirt and impurities; it is opened and cleaned by a machine called a *willow*, consisting of a box containing a conical wooden beam studded over with spikes, and passing between other spikes fixed within the case or cover. The beam is made to revolve rapidly, and as the cotton is put in at one end of the machine it is caught by the

spikes, and tossed and shaken about in its passage to the other end. Sand and other heavy impurities fall out through a grating at the bottom, while the dust and lighter impurities pass up a shoot, in which a draught is maintained by means of a revolving fan.

Some of the finer varieties of cotton are not submitted to this



Fig. 317.—SORTING AND PULLING.

process, but are beaten or *batted* with twigs of hazel or holly, three or four feet long, upon a frame, the upper surface of which is made of cords, so as to present an elastic surface. Women are employed at this work with a rod in each hand (Fig. 318), by



Fig. 318.—BATTING COTTON.

which means the tangled locks are opened and cleaned without injuring the fibre; but fragments of seed-pods, which adhere somewhat firmly, are picked out by hand.

For common work the batting is done by a *scutching-machine*, or *blowing-machine*, in which the cotton from the willow is spread out upon an endless band in regulated quantities, and entering the machine, is seized by rollers and exposed to the blows of a *batting-arm*, or *beater*, whereby dirt and dust are got rid of; the cotton is opened, and the wind produced by the rapid motion of the beater drives the filaments onward, where they are exposed to a second beater, from which they are blown upon the surface of a revolving wire-gauze drum, beneath which, and in close contact with it, is an endless band, which receives the cotton, and conveys it out of the machine in the form of a filmy sheet, called a *lap*. The arrangements of the batting and lapping-machine will be understood by referring to Fig. 319. At A a portion of the feed-

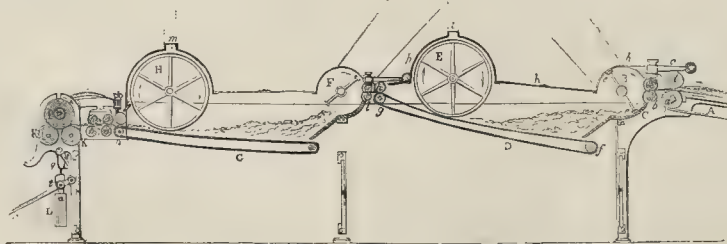
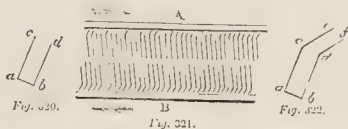


Fig. 319.—SECTION OF BATTING AND LAPPING-MACHINE.

apron is shown passing over a roller *a*. Upon this apron the willed cotton is spread in weighed quantities in a layer about two inches thick, and is carried forward by this apron to the feed-rollers *b*, which are pressed together by a weight acting on a lever *c*. A wooden roller *d* keeps the cotton close to the apron, and guides it between the feed-rollers, which are small coarsely fluted iron cylinders. The first beater *B* consists of two flat bars *ee*, fixed upon a revolving shaft, at right angles, so as to strike upon the cotton filaments as they are delivered by the feed-roller. This scutching-shaft revolves 2000 times per minute. At *C* is a grating in the form of a quarter of a cylinder, against the bars of which the cotton is scutched by the beaters, and thoroughly opened, after which it is thrown upon the apron *D*, which turns upon rollers *f, g*. *E* is a revolving cage, enclosed under the cover *h*, at the top of which is a pipe *i*, which communicates with a revolving fan. This cylinder allows the dust to pass through it, and also serves to spread upon the apron the loose cotton filaments in the form of a level fleece, which passes off under the wooden roller *h*, and is thence drawn in by the second pair of feed-rollers *l*, in order to be exposed to a second scutching by the beater *F*. This beater delivers the filaments to a second apron *C*, where they are exposed to the sucking action of a second sieve cylinder, which communicates with a fan by the opening *m*. There the cotton is again formed into a fleecy mass, and is carried through between the two pairs of iron rollers *oo* and *pp*, the upper ones being weighted. These rollers deliver the compressed fleece to the wooden lap cylinder *I*, whose axis is loaded by hanging weights, as at *L*, so as to bear down between the two rollers *kk*, which, revolving both in one direction, carry round with them, by friction alone, the lap cylinder. As this cylinder increases in diameter, the links *q* progressively rise up, with their weights *L*, so that the pressure continues always uniform. When the coil of lap has attained the proper size, the twin rollers *oo*, with the aprons, cages, and feed-rollers, throw themselves out of gear, whilst the twin rollers *pp*, and the lap cylinders continue to revolve, whereby the fleece is torn or cut across in the middle line between the two pairs of twin rollers. The attendant now lifts the lever *r*, which raises the links *q*, and suspends the weights *L* by the hook *s*. In this way he relieves the axis of the lap cylinder, removes it, and puts an empty one in its place. He next throws the machinery once more into gear, disengages the connecting rod *t* from the hook *s*, and restores the action of the weight, while he guides the beginning of the fleece round the empty roller.

The next operation is *carding*, by which the fibres are combed out and made parallel. A cotton card is a kind of wire brush, made of bands or fillets of leather pierced with numerous holes, in which are fixed bent pieces of hard-drawn iron wire, called *dents* or *teeth*. Each piece of wire is first bent at right angles, as at *ab*, Fig. 320; then each limb receives a second bend, as at *cd*, Fig. 322, at a determinate obtuse angle, which must be the same throughout the set: the teeth must stand at equal distances, and be equally inclined to the curved surface of the drum round which the card is lapped. The action of the cards upon the tangled fibres will be seen from Figs. 321 and 324. If two cards *A* and



be moved in opposite directions with the tangled tuft of cotton between them, the fibres will be evidently combed into parallel lines by repeated applications of the cards, each card taking up and retaining a portion of the cotton. On reversing the position of the cards, and placing them as in Fig. 323, all the cotton may be got upon one card, since by drawing the upper card *a* over the lower *b*, the teeth of the latter can offer no resistance, and it will give up its cotton to the upper card. In the carding-engine, a section of which is shown in Fig. 324, the main carding cylinder *A* is formed of parallel segments of mahogany, to each of which is attached a length of card-

leather. The small rollers *D E F G*, called *urchins* or *squirrels*, are covered with card fillets wound spirally round each from one end to the other. The engine is fed by means of a pair of fluted iron rollers *h*, pressed together by a screw *c*; *h* is a feed-board, along which the fleece, as it is unwound from the lap roll *I*, by the acting roller *k*, advances to the feed rollers. The first roller card *D*, called the *licker-in*, turns much more slowly than the drum-card,

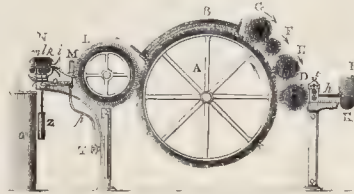


Fig. 324.—SECTION OF CARDING-ENGINE.

and draws in single filaments from the feed roller. These are stripped off from it by the large cylinder *A*, to be again teased out by the teeth of the second roller *E*, which moves still more slowly than *D*, and serves to pick off the knots from the drum. These knots being carried round by the roller are again presented to the cylinder *D*, as it revolves nearly in contact with *E*. The roller *D* next transfers the teased out filaments to the drum, blending them with fresh ones supplied by the feeding rollers. The tufts or knots which escape the action of the first two rollers *D* and *E*, are almost sure to be laid hold of by the fourth roller *G*, which is placed closer to the drum, and moves with the same speed as *E*. The knots caught by *G* are teased out by *F*, which is nearly in contact with it, but revolves at a quicker rate, but not so fast as the surface of the drum. The loosened fibres are thus seized by *F*, and once more transferred to the drum, whence they proceed, and receive a second teasing from the roller *G*. Any knots which still remain are arrested by the first flat top cards, and held there till they are disentangled by the rotation of the drum. These flats are occasionally taken out and cleaned, and the first flats require more frequent cleaning than the others. After the filaments of cotton have passed by the flats, they lie in nearly parallel lines among the card teeth of the drum, and from these they are removed by a smaller drum card, which is covered spirally with fillet cards, and is called the *doffer*. This doffer *L* turns slowly in contact with the drum, and in an opposite direction, and thus becomes covered with a fine fleece of cotton, which is removed from the opposite side of the cylinder by the vibrating action of the doffing knife *M*, Fig. 325. This consists of a blade of steel, toothed at its

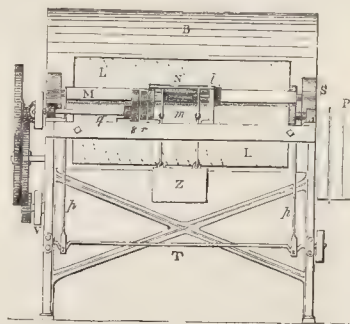


Fig. 325.—THE CRANK AND COMB.

edge like a fine comb, and it is made to strike down by means of the crank *T* and the upright rods *pp*, with a rapid motion tangentially over the points of the cards. In this way a fine transparent fleece is removed, equal in breadth to the length of the card on the doffer, but its breadth is immediately contracted into that of a narrow riband, by being passed through the funnel *i*, Fig. 324. This riband is called a *card-end* or *silver*, and it is consolidated by being passed between three pairs of iron rollers *k, l, m*; the bottom rollers of *k* and *l* are finely fluted, or channelled, and

the top ones are covered with two coats, the inner of flannel and the outer of leather. The upper rollers are pressed upon the lower ones by weights *z* hung upon their axis. We here first observe the effect of the beautiful invention of passing the cotton between pairs of rollers moving with different degrees of speed. The pair of rollers *l* moves faster than the pair *k*, the effect of which is to draw out and straighten the filaments. The card end, after being spread by the first two pairs of rollers into a flat riband, is passed through a vertical slit in a plate *N*, situated between the second and third pairs of rollers, which gathers it up into an elliptical sliver; it is next drawn through two smooth rollers *m*, which are slightly pressed together, and lastly it is received into the tin can *o*, in the shape of a spongy, slightly coherent sliver. In fine spinning the cotton passes through two carding-engines; the first, which is coarse, is called a *breaker-card*, and the second, in which the teeth are set finer, a *finishing-card*. A number of cardings from the breaker card are united together at the edges by passing them between the steel rollers of a lap-machine: the new lap is wound upon a cylinder from which the finishing card is fed. Fig. 326 represents a carding-engine with the card tops drawn off.

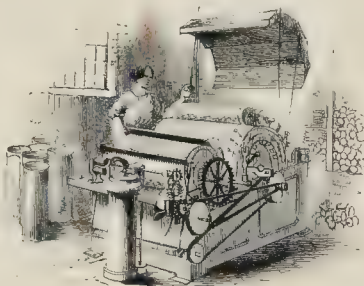


Fig. 326.—CARDING-ENGINE.

The spongy slivers, or ribands, prepared by the carding-engine are next subjected to the operations of *drawing* and *doubling*, by which the filaments are equalised, drawn out, and placed in parallel order. The principle of drawing depends upon the action of three pairs of rollers moving with different rates of speed, and by bringing a number of slivers together and drawing them into one, the different qualities of the cotton are equalised, and the sliver is attenuated preparatory to the next process. The drawing-frame is shown in Fig. 329, but its action will be better understood from the diagram Fig. 327. A number of slivers *n n*, contained in cans, are passed over a smooth curved plate of metal, with a channelled

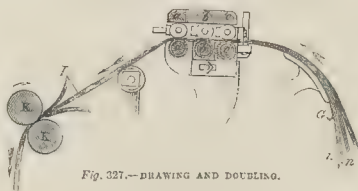


Fig. 327.—DRAWING AND DOUBLING.

surface, shown separately in Fig. 328, by which they are guided to the rollers. From three to six slivers are thus brought together, and are made to converge, so as to pass together between the rollers, by which means the sliver, doubled from three to six-fold, is drawn out into a uniform sliver of greatly increased length. Two such slivers are usually again brought together in a funnel *i*, and are delivered by the two smooth rollers *k k* into a can in front of the machine, by which means the cotton filaments, spread out broad and thin by the drawing-rollers *a, b, c*, are collected into a compact riband, which being thus drawn out with repeated doublings, becomes very regular in texture, and, if the subsequent operations be well conducted, it produces a level yarn. If it were attempted to draw out a single sliver until the filaments were properly parallel, it would soon become too much attenuated for the purpose, but, by



Fig. 328.

repeatedly doubling and drawing together a number of slivers into one riband, we produce an effect similar to that of taking a lock of cotton-wool between the finger and thumb of one hand, and drawing it out with that of the other, laying the two parcels parallel before repeating the operation. The following details will give some idea of the elaborate nature of drawing and doubling.

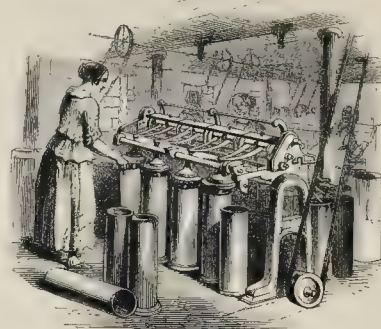


Fig. 329.—DRAWING-FRAME.

Suppose ten card-ends to meet and unite in passing through the first pair of rollers, whereby they are all reduced to one sliver, the second pair reduces every inch of this compound sliver into about 2 inches, and the third pair of rollers extends these 2 inches into 10; so that the result of this first operation is a sliver of the same thickness as one of the ten card-ends, but of ten times the length. Next let us suppose that ten cans filled with the compound sliver are passed on to a second drawing-head, and the ten drawings are again doubled and drawn out into one; that twelve of these are doubled and drawn out at a third head; that twelve of these are doubled again and drawn out at a fourth head; and, lastly, that six of these are doubled and drawn out at a fifth head. Now, collecting all these numbers together, it will be seen that before a thread is attempted to be spun, the fibres are placed parallel to each other 86,400 times; for $10 \times 10 \times 12 \times 12 \times 6 = 86,400$. The drawing is carried on to this extent only in fine spinning. For coarse numbers six card-ends are usually passed through the first drawing-head, and formed into one riband. Six of these ribands are again formed into one; six of these make a third sliver, and five of these are passed through the last drawing-head. Thus the doubling of the fibres of the cardings has been multiplied $6 \times 6 \times 6 \times 5 = 1080$ times. The quality of the yarn depends greatly on the success of the process. It is stated of Arkwright, the perfecter, if not the inventor, of the process, that when any defects appeared in his yarns, he told his people to look to their drawings, for if they were right, everything else would be so too.

The riband, formed of parallel fibres in the process of drawing, is next slightly twisted, so as to allow it to be still further attenuated by drawing, this slight amount of twist giving it sufficient strength for the purpose. This, the commencement of spinning, is called *roving*, and it is performed by a machine called the *bobbin-and-fly frame*, Fig. 330, which not only twists the sliver into a roving, but winds it in a regular and equable manner upon the bobbin. The bobbin, Fig. 333, is a wooden tube, upon which the roving is wound so as to produce conical ends, Fig. 334, by shortening the up and down motion of the bobbin, whereby the roving is distributed equally and compactly over the bobbin, which object is further assisted by the steel finger of the fly, Figs. 331, 332, over which the roving is twisted, and which winds it on the bobbin with a certain pressure. The spindles contain two arms *gg*, called the flyer, or fly, one of which is hollow, for containing the roving, while the other is a counter-balancing solid rod, to prevent it flying off the spindle. The bobbins containing the sliver are mounted on a shelf called a *creel*. From these bobbins the sliver is passed through a set of drawing rollers, which extend somewhat the sliver, and pass it down to the spindles, which, by their rapid rotation, twist or spin it into roving, and then wind it upon the bobbins which surround the spindles. A motion of ascent and descent is given to the bobbins, in order that the roving may be properly wound, and

as the bobbins become filled its speed is slightly slackened, in order that the roving may not be improperly stretched. Two sets of bobbin-and-fly frames are in common use; they are called the *coarse* and the *fine*, or the first and the second roving-frames. The second roving-frame is fed with rovings, or *stubbings*, as they are now called, from bobbins filled at the first frame, and they are

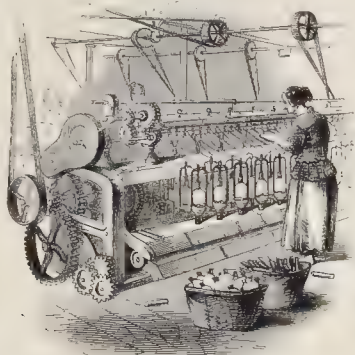


Fig. 330.—BOBBIN-AND-FLY FRAME.

arranged on upright skewers on a shelf, or creel, placed behind the roller-beam. The roving from these bobbins passes through wire eyes, to prevent it from being torn obliquely from the bobbins. In the coarse roving-frame the upper part behind the rollers has a smooth plate, over which the sliver glides from the cans towards the rollers. There is also a rod stretching over the machine with

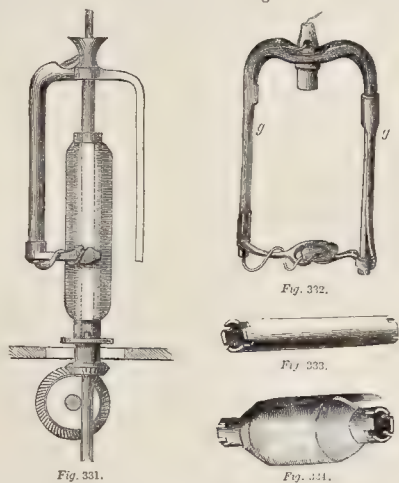


Fig. 331.

Fig. 332.

Fig. 333.

Fig. 334.

a guide at the end, for moving the strap or band which drives the pulley, so that by moving this rod to the right or to the left, the machine can be thrown in or out of gear.

It will be understood from these arrangements that the twisting of the sliver is produced by the rotation of the spindle and fly. The amount of twist depends on the ratio between the surface speed of the front delivering-roller, Fig. 330, and the revolution of the spindle. The winding on of the twisted roving upon the bobbin is effected by giving to the bobbin such a velocity, that the difference between the motion of the surface of the bobbin and the motion of the delivering end at the arm of the flyer be equal to the surface motion of the roller, or the supply of the sliver. The spindle and the bobbin being driven by different movements and

at different rates, the winding is effected either by making the bobbin revolve a little faster than the spindle, or the spindle faster than the bobbin. If, for example, the bobbin revolves fifty times while the spindle only revolves forty, forty turns of the bobbin will have nothing to do with the winding; but there are ten turns of the bobbin above those of the fly which will perform the winding. Hence the forty turns of the spindle produce twist, while the fifty turns of the bobbin produce ten coils of the roving upon its barrel. In the coarse roving-frame the spindles revolve on an average 750 times per minute, turning off for each spindle 400 inches per minute, or 666⅔ yards per hour. In the fine frame there is more twisting power, and this produces on an average 533⅓ yards per hour. In the coarse frame the sliver is elongated from four to six times, the principal draught of four and a half being between the front and middle rollers, and the remaining one and a half between the middle and the back rollers. For fine spinning, the rovings are weighed on the bobbins by a quadrant beam, and distributed according to their respective weights into five numbered baskets. In some coarse spinning-mills only one carding, one drawing, and one roving are employed for manufacturing the yarn used for the cheapest calico.

The rovings are usually spun into yarn by one of two machines, viz., the *throstle* and the *mule-jenny*, according as it is intended for warps or for wefts. In the throstle the yarn is spun and wound upon bobbins at the same time; in the mule, a certain length of yarn having been made, the operation of spinning is suspended while the yarn is being wound up on bobbins, or spindles. Throstle-yarn, or *water-twist*, so called from its having been originally produced at a frame turned by water power, is smooth and wiry, while the mule-yarn is soft and downy. The throstle consists of two roller beams, each provided with the usual three-fold set of drawing-rollers, which, instead of being mounted in four and sixes upon independent heads, are all coupled together in one range upon each side of the frame. The top rollers are, as usual, covered with leather, and the roving passes over a guide-bar, to which a slight horizontal movement is communicated, for the purpose of leading the roving over different points of the rollers, and thus preventing the leather from being chafed by constant pressure on one spot. The machine is usually made double—a row of bobbins, spindles, &c., occupying each side of the frame. The bobbins, filled with rovings, are placed upright upon skewers fixed in shelves in the middle of the frame, or creel. There are usually from seventy to 150 spindles on each side of the throstle, and they are set from 2½ to 3 inches apart. The spindles on both sides are driven in common by means of bands from the long horizontal tin cylinder, which extends the whole length of the machine; this cylinder is seen in Fig. 335, and also in section c, Fig. 336. On quitting the last pair

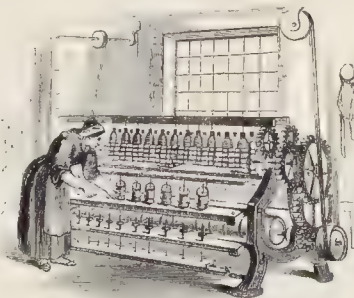


Fig. 335.—THE THROSTLE.

of rollers, each roving is guided by a little ring, or notch of smooth glass let into the frame at *e*, towards the spindles, which revolve with great rapidity, producing by the motion of their flyers a low musical hum, which is supposed to have given the name to this machine.

The roving, which may now be called *yarn*, passes through an eyelet formed at the end of one of the arms of the flyer, and thus guides the yarn to the bobbin, which revolves round the spindle axis in the middle, between the two prongs of the flyer. Immediately over the spindle is an eyelet of wire, which serves as a

guide to the roving, which is led once or twice round the arm of the fly, and then passed through one of its hooked extremities. The yarn is wound upon the bobbin by a curious contrivance. The bobbin fits very loosely upon the spindle, and rests with one end upon the coping-rail *c*; the bobbin is not connected with the spindle, except by the thread of yarn which has to be wound, so

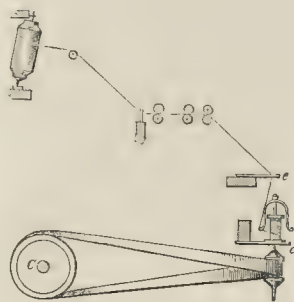


Fig. 336.—PRINCIPLE OF THE THROSTLE.

that as soon as the flyer is set spinning, the thread drags the bobbin after it, and makes it follow the motion of the spindle and fly; but the weight of the bobbin and its friction on the coping-rail, which is promoted by covering the end with coarse cloth, causes it to hang back; and thus the double purpose is served of keeping the thread stretched, and winding it on the bobbin much more slowly than the flyer revolves. The yarn is

equally distributed on the bobbin by a slow up-and-down motion of the coping-rail. These effects are similar to those of the bobbin-and-fly frame, only the means are simpler. In the bobbin-and-fly frame, the bobbin and spindle are made to revolve by distinct mechanical movements; while in the throstle, the bobbin is made to revolve by the pull of the yarn, which is sufficiently strong for the purpose; whereas the roving in the bobbin-and-fly frame could not bear such a strain.

It has already been noticed that the machine called the mule-jenny spins a different kind of yarn from that produced by the throstle. The object of mule spinning is to convert the rovings into yarn, and to wind it upon spindles. The mule consists of four principal members: viz. 1. Drawing rollers; 2. A carriage, movable upon iron rails, placed at right angles to the drawing rollers or roller beam; 3. A head-stock for drawing the different

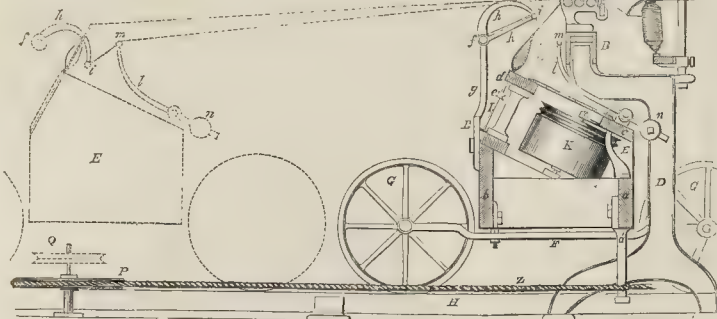


Fig. 337.—CROSS SECTION OF THE MULE-JENNY.

parts; and 4. A creel-frame for holding the bobbins of rovings which are to be spun into yarn. The action of this machine will be better understood from the cross section, Fig. 337, where the dotted lines represent the carriage, when it is fully drawn out. *A* is a triple set of drawing rollers, working in heads fixed upon the roller beam *B*; *C* is the creel for holding the roving bobbins in three, and sometimes in four rows, one over and behind another. To lessen the friction in unwinding the roving, the lower ends of the bobbin skewers stand in *creel-steps*, or small conical cups of glazed pottery. The creel and roller beam are supported by frame-pieces of cast-iron, as at *D*. *E* *E* is the carriage to which are attached three or four horizontal bars *F*, which rest upon the axis of the wheels *G* *G*. The wheels run upon the railway *H*. The carriage is formed of two long planks *a*, *b*, extending through its whole length, and barred with cross pieces of wood or iron made fast by screws; there are also

diagonal braces and other contrivances to prevent warping or vibration. Upon these planks is built a frame-work *c*, *d*, in front of which are fixed the top bushes and bottom steps of the spindles *i*. The spindles are set in an inclined position, sloping towards the roller beam, so that in revolving, the threads may be twisted round their points without being wound upon their surfaces during the coming out of the carriage; *e* are little pulleys called wharves, fixed upon the under part of the spindles, each at a different height, throughout a range of eight or sixteen adjoining spindles. *K* is one of a series of drum cylinders, usually made of tin plate, each furnished with two grooves round the upper end for receiving the driving bands. Their smooth sides receive and work the moving bands or cords of two ranges, containing from sixteen to thirty-two spindles. The uppermost cord impels the first spindles of the adjoining two rows; the second cord moves the second spindles of the same ranges, and so on in succession; *f* is a long, slender iron shaft lying on the bearings *g*, over the carriage from end to end, and provided with small arms *h* *h*, called the *fallers*. These bear the *faller wire*, which serves to depress all the threads from the points of the spindles, as in the dotted lines under *i*, and to bring them upon a level with the bottom of the cop in the act of winding on. The wire being then gradually raised, the thread is duly distributed upon the cop. To assist the spinner in applying the faller wire, so as to coil on the yarn with regularity, there is another wire called the *counterfaller*; this consists of lever arms *l*, with the fulcrum attached to the framework: these arms bear at their points *m* a wire which extends horizontally, like the faller, from end to end, but beneath the surface level of the threads. On the other ends of these levers are weights *n*, which cause the wire *m* to rise, so as to balance the threads after they are depressed by the faller wire *i*, and to straighten them when loose. The carriage is drawn out by a rope *z*, passing round two horizontal pulleys, only one of which is shown in Fig. 338, and this is in front of the mule, at the spot to which the carriage comes on completing its stretch: this pulley *P* turns freely upon an upright stud in the floor, and is looped round a bolt *a'*, attached to the carriage *E*. The spindles receive their whirling motion all the time that they go out and in with the carriage by means of a distinct band passing round a twist pulley, provided with six grooves of progressively increasing diameter, calculated to vary the whirling velocity of the spindles. This pulley is situated in the head-stock at the back of the mule, not shown in the figure; but an endless band proceeding from it passes over a guide pulley, and then over the top grooves of the drum *x*, thus driving all the drums on the right-hand side of the carriage; the band

then returns round their second grooves, and passes to the drums at the left-hand side of the carriage. After driving all the drums

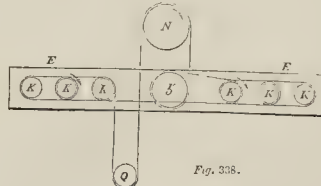


Fig. 338.

there, it returns to the middle of the machine, and passes over guide pulleys to the horizontal pulley *Q*, which revolves freely on the same upright bolt with the rope pulley *P*, and from thence

proceeds to the twist pulley. By this contrivance the band is always of the same length, whether the carriage be in or out, and the drums *K*, which work the spindles, are thus continued in motion, at whatever point of its course the carriage may happen to be. Fig. 338 will convey a general idea of the working of these band coils. *N* is the twist pulley, *Q* the end pulley, *K* the carriage drums, and *E E* the carriage. It will be seen that the carriage can be moved backwards and forwards between the fixed centres of the pulleys *N* and *Q*, while the coils of the band continue to move round the drums. It must be remembered, however, that the revolving parts do not lie in one plane, as in Fig. 338, but in different planes, the band being conducted over guide pulleys, wherever a change of plane occurs. Supposing the rollers to be delivering the roving properly drawn out, the carriage is moved out with a speed somewhat greater than that of the front rollers, by which means the yarn is equalised, the thicker parts becoming extended, while the whole is being twisted, the spindle being made to revolve while the carriage is being moved out; but when the carriage has been moved out about forty-five or fifty inches, the rollers are made to stop, and thus cease to deliver thread. The carriage is then slowly moved out to the end of its course, and the velocity of the spindles is nearly doubled, so as to give an additional twist to the yarn, called the *stretching* or the *second draw*. The yarn is now stretched to the full extent that it will bear without breaking, but the spindles are made to revolve until the twist-wheel has completed a certain number of turns,—the amount of twist being regulated by the purpose to which the yarn is to be applied, more twist being given for warps than for wefts, and for bobbinet and book-muslin yarns than for those of softer fabrics. A finger attached to the twist-wheel now disengages a catch, whereby the driving strap is now pushed on to the loose pulley, and the machinery is brought to rest. The spinner then turns a winch-handle which acts on a pulley that moves all the spindle drums, and he thus makes the spindles turn a short space backwards, in order to take off the slant coils from the upper ends of the spindles, and to prepare for distributing the fifty-four or fifty-six inches of yarn just spun upon them. The spinner now seizes the faller rod with his left hand, and depresses the faller wire, so as to bear all the threads before it to a level with the bottom of the cops, then with his right hand he turns the handle of the pulley, which sets the spindles revolving in the proper direction for winding up; at the same time, applying his knee to the carriage, he pushes it in at the proper degree of speed required for winding the yarn on the cop. As the carriage approaches to its primary position near to the roller beam, he allows the faller wire to rise slowly to its natural elevation, whereby the threads once more coil slantingly up to the top of the spindle, and are thus ready to co-operate in the twisting and extension of another stretch of the mule. Having pushed the carriage home, the spinner immediately sets the mule again in gear with the driving shaft, by transferring the strap from the loose to the fast steam pulley, and thus commences the same beautiful train of operations. It is during the few instants after the carriage starts, that a number of little girls called *piecers* or *pieceners*, are seen skipping from point to point to mend the broken threads. Whenever it has receded a foot or two from the delivering rollers, the possibility of piecing the yarn being at an end, the children have an interval for repose or recreation, which, in fine spinning at least, is three times longer than the period of employment. The spinner, likewise, has nothing to do till after the completion of the fresh range of threads, when he once more backs off the slanting coil, and winds on the stretch. By winding successive portions of yarn upon the spindle, the cop, Fig. 339, is formed; this, when slid off the spindle, is sold as *cop-yarn*. If intended to be dyed or exported, it is wound upon reels, and made up into skeins or hanks. Some skill is required to give the cop such a shape that it may deliver itself easily upon the reel, or when placed in a shuttle. The part of the cop which is first formed is a double cone *a, b, c*; upon the upper part of this, the cone is built upwards into the form of a cylinder *a, b, c, f*, and terminating in a cone at the top. The mode of building up the cylinder is shown by the dotted lines.



Fig. 339.

We have described the mule-jenny in such a form as to be intelligible without the aid of numerous complicated diagrams. The mule at the Crystal Palace is a *power-mule*, in which the work of the spinner in regulating the faller wire, winding up the yarn on the spindles, and pushing in the carriage, is all done by machinery,—the only attendance being that of the pieceners to join the broken threads.

Yarn intended for warps is wound off into measured lengths of 840 yards, called hanks. This is done by means of a six-sided reel, $1\frac{1}{2}$ yards in circumference, mounted in a carriage which carries the spindles, or secures the skewers that bear the bobbins or cops (see Fig. 340). The carriage has a slow traverse motion



Fig. 340.—REEL FOR WINDING AND COUNTING HANKS.

for distributing the thread, and the reel revolves eighty turns, as indicated by the striking of a bell, when the attendant knows that a *ley*, or *rap*, of 120 yards has been formed: seven of these raps make a hank of 840 yards. The hanks are tied round with a string to separate and distinguish them, and they are then slid off the reel. The size of the yarn is ascertained by weighing the hanks, and dividing 1000 grains by the number of grains in a ley. A ley is $\frac{1}{4}$ th of a hank, and 1000 grains are equal to $\frac{1}{4}$ th of a pound. The average number of hanks to the pound is, for coarse spinning, from ten to forty; but for some purposes, such as candlewicks, counterpanes, &c., the number of hanks to the pound may not be more than two, whereas some of the finest muslin yarn may be from 300 to 600, and much higher numbers have even been attained; they are of course very costly, and have produced twenty guineas and upwards per lb.

Yarns are sent to the market in cubical bundles of 5 or 10 lbs. weight, and they are made up at a bundling-press (Figs.

341, 342), which greatly diminishes the bulk of the yarn, and preserves it from injury. It consists of an iron frame, beneath a wooden table *B B*, on one side of which the yarn is arranged for packing, and on the other the papers and twines. The bundles of yarn are placed between two upright sets of flat bars *b b*, resting on a piece of wood upon the iron press-plate; in this wood are grooves for the thread or twine, the loose ends of which hang down between the spaces of the upright flat bars. When the hanks have been twisted and put in their places, the top rails *g g* are lowered, and the key-rods are pushed into the slits of the rails. The iron cross *F* is then turned; this acts on pinion *c*, and a ratchet-wheel furnished with a click *a* prevents the wheel from flying back: on one of the radial arms of this wheel is a connecting-rod *Q*, the upper end of which is attached to the press-plate, which must move upwards when the wheel is turned round. When, by this means,

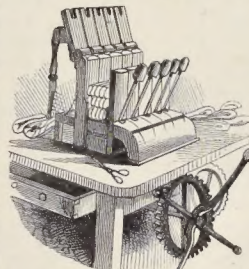


Fig. 341.—BUNDLING-PRESS.

the bundle is sufficiently compressed, the attendant binds the twine round it, then pushes the click out of the ratchet-tooth, and the cotton, by its elastic rebound, drives down the press-plate.

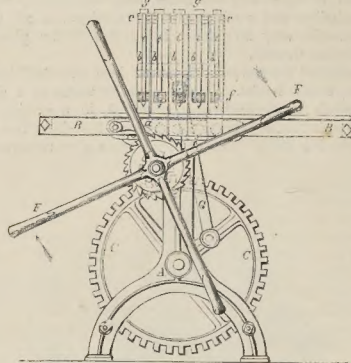


Fig. 342.—WORKING PARTS OF BUNDLING-PRESS.

Fine yarns are subject to a curious process, for the purpose of getting rid of those loose, divergent fibres which interfere with their level compact appearance. This is done by passing the yarn rapidly through a gas flame, as shown in Fig. 343, where the yarn,



Fig. 343.—“GASSING” THE THREAD.

proceeding from one bobbin *d d*, passes through the flame to another bobbin *b b*, which is also kept in motion by means of the tin drum *c*, which, in its turn is moved by the strap *a a*. The thread between the two bobbins is led over pulleys backwards and forwards, through the flame, which singes off the loose fibres, and diminishes the weight of the yarn, so that a yarn of No. 90, may thus become No. 95, making a difference of five hanks per lb. by *gassing*, as this operation is called. When the yarn passes out of the flame for the last time, it is cleaned by moving over the surface of a brush, and it is then passed through a small hole in a piece of brass, which detects any knot or foul point in the yarn—for the hole is only just large enough to allow the yarn to pass, and should there be any impediments, the piece of brass becomes depressed, and this acts on a lever which turns the gas-flame aside, and lifts the bobbin away from the rotating barrel: the yarn thus remains at rest till the tenter-woman removes the impediment, and sets the machinery again in motion.

We have thus far described the manufacture of yarn, which consists of a number of fibres twisted in one direction: *thread* is formed by the twisting together of two or more yarns. There are

various kinds of thread: *lace-thread*, which is made of fine numbers of yarn, usually consists of two yarns twisted together; *sewing-thread* consists of three or more yarns twisted together; while *stocking thread* varies in the number of its component yarns considerably.

The *thread-frame*, or doubling and twisting mill, Fig. 344, resembles the throstle already noticed. The doubling is effected by

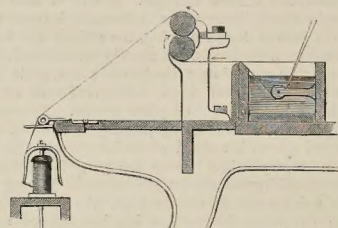


Fig. 344.—SECTION OF THREAD-FRAME.

spindles and flyers, and the twist given to the doubled yarns is usually in an opposite direction to the twist of the individual yarns. The frame has a pair of rollers for delivering the yarns at a measured rate to the twisting spindles, so as to produce a regular and equal twist; and after the thread has been twisted, it is wound upon bobbins, which are dragged round by the thread itself, the rail upon which they are placed having the usual up-and-down motion. As the yarns are unwound from the bobbins or cops, they are led over a guide-bar into a vessel containing water, or a weak solution of starch, which enables the lines of yarn to twist into a more solid thread than if they were dry. On leaving the trough the yarns are guided over a roller, which lays them nearly parallel, and they then pass down to the eyelet at the extremity of the flyer, the rapid motion of which twist them into a solid cord or thread.

The thread is next made up into hanks for the purpose of dyeing or bleaching, after which it is wound upon bobbins for the purpose of *balling* or *reeling*. This last process is performed by a young woman, who is seated at a kind of turning lathe, with the bobbin of thread mounted upon a spindle above her head: she seizes the end of the thread, and attaches it to a rod of steel, sets this spinning, and in an instant a ball of cotton appears at the end of the rod. The rotation is stopped, a blue ticket is inserted at the end, a further quantity of thread wound to secure the ticket, and the ball is finished. The size of the ball is regulated with great accuracy by the eye. The cotton is also wound upon reels with surprising celerity; the steel finger which delivers the thread from the bobbin being guided to and fro to distribute it equally along the barrel of the reel.

We here conclude our notice of those departments of the Crystal Palace which are arranged in a systematic manner. Some of the Courts originally intended for the illustration of the Useful Arts—such as the Court for Musical Instruments, the Court for Printed Fabrics, the Court for Woollen and Mixed Fabrics—have been appropriated to other purposes. In various parts of the building there are displays of manufactured articles for sale; but as these collections partake rather of the character of a bazaar than of a museum,—of a shifting miscellaneous nature, intended for the eye of the customer, instead of a methodical collection of models and objects illustrating processes intended for the eye of the student,—we have passed them over. Single machines, agricultural implements, carriages, &c., for the most part tell their own tale, or are interesting only to those persons concerned in their use. Had it been our purpose to describe single objects, this work might have been indefinitely extended; but on comparing what we have written on the Fine Arts and the Useful Arts with the originals, the reader will probably agree with us that enough has been said to impart a vivid idea of the Crystal Palace to those who have not yet visited it, and to awaken pleasant memories in the minds of those who have done so.

THE END.

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